1830A
RF Power Meter for Metrology

Instruction and Service Manual
PN# 1830A-901-01
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TEGAM is a manufacturer of electronic test and measurement equipment for metrology, calibration, and production test. We also provide repair, calibration, and other support services for a wide variety of test and measurement equipment including RF power sensor calibration systems, RF attenuation measurement systems, ratio transformers, arbitrary waveform generators, micro-ohmmeters, LCR meters, handheld temperature calibrators, thermometers, humidity and temperature control devices, and more.

TEGAM also repairs and calibrates test and measurement equipment formerly manufactured by Electro-Scientific Industries (ESI), Gertsch, Keithley Instruments, Lucas Weinschel, and Pragmatic Instruments. A complete list can be viewed on our Product Service Directory at www.tegam.com

For more information about TEGAM and our products, please visit our website at www.tegam.com: or contact one of our customer service representatives at sales@tegam.com or 800-666-1010.

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Safety Information & Precautions:

The following safety information applies to both operation and service personnel. Safety precautions and warnings may be found throughout this instruction manual and the equipment. These warnings may be in the form of a symbol or a written statement. Below is a summary of these precautions.

Terms in This Manual:

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

Terms as Marked on Equipment:

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

Symbols:
As Marked in This Manual:

⚠	This symbol denotes where precautionary information may be found.

As Marked on Equipment:

⚠	CAUTION – Risk of Danger
⚡	DANGER – Risk of Electric Shock
⏚	Earth Ground Terminal
I	On
O	Off
⏚	Frame or Chassis Terminal
⏚	Earth Ground Terminal
∿	Alternating Current

Purpose and Function

The 1830A power meter is designed for thermistor based RF power sensors which are universally recognized as the most accurate means to measure and transfer RF power. The TEGAM Model 1830A is designed to replace the HP432 while further reducing uncertainties and accommodate a wider variety of RF power sensors. It combines a modern DC substitution bridge with a 6.5 digit measurement system to provide consistent normalized RF power readings manually or automatically.

Key functions of the 1830A:

- Replaces the HP432 RF Power Meter
- Compatible with thermistor power sensors from: Agilent (HP), TEGAM, Weinschel, Hughes, General Microwave, Millitech
- Supports 100 Ω and 200 Ω thermistors
- Integrates bridge balancer and power meter into one package
- Four digit calibration factor resolution
- Full remote programmability
- Heater control for ovenized sensors
- LXI Compliant

Capabilities

There are many thermistor based RF power sensors available. The Model 1830A is designed to bias either 100 Ω or 200 Ω mounts and has dual bridges for balancing both RF sense and compensation thermistors such as contained in the Agilent 478A and 8478B. It also is works with the Agilent 486A series of waveguide sensors and includes a heater circuit for all TEGAM and Weinschel ovenized thermistor mounts.

Figure 1.1 - Model 1830A RF Power Meter

Specifications

(Includes performance characteristics, description, power and utility information and environmental information)

Power Range (typical, sensor dependent)	0.001 to 30 mW (-30 to +14 dBm)
Frequency Range	100 kHz to 110 GHz (sensor dependent)
Accuracy	±0.05% of reading, ±0.5 µW (0.1% at 1 mW)
Measurement Scale	mW dB
Cal Factor Resolution	4 digits, linear decimal
Bridge Resistance	Variable from 50 Ω to 300 Ω (RF termination 12.5 Ω to 75 Ω)
Connectors Bias Voltage Temp	14-pin Quick Connect 4-pin mini-microphone
Heater Controller	8 VDC @ 200 mA (compatible with all TEGAM and Weinschel thermistor mounts)
Environmental Specified Temperature Range Operating Temperature Storage Temperature Calibration Temperature Humidity	+17°C to +29°C (+63°F to +84°F)[1] 0 °C to +55 °C (+32 °F to +131 °F) -40 °C to +75 °C (-40 °F to +167 °F) +17°C to +29°C (+63°F to +84°F) 0% to 95%, non-condensing
Power Requirements	100 to 240 Vac, 48 to 62 Hz, 75 VA max
Input Power Fuse	250 V, 1.5 Amp (slow blow)
Weight	2 kg (4.4 lb)
Physical Dimensions Height Width Depth	 8.89 cm (3.5 in) 21.59 cm (8.5 in) 36.5 cm (14.5 in)

Table 1.1 Physical and Electrical Specifications

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[1] Please note that the Celsius scale specifications are controlling, the Fahrenheit conversions are approximations for information only.

Power Source
This product is intended to connect to a power source that the voltage between the supply conductors or between either supply conductor and ground will not apply more than the voltage rating for the particular power supply. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Line Voltage Selection
The power supply in a Model 1830A operates with a line voltage of 100 to 240 VAC at 48 to 62 Hz.

CAUTION DO NOT APPLY POWER TO THE INSTRUMENT BEFORE READING THIS SECTION.

Check the Power Cord
Make sure the power cord supplied with the Model 1830A is not frayed, broken, or cracked. A damaged power cord is a fire and electrical hazard. If the power cord is damaged, it should be replaced.

Use the Proper Fuse
To avoid fire hazard, use only the correct fuse type as specified for the AC power supply in the unit. The correct fuse for the 1830A is a 250 V 1.5 Amp slow blow fuse.

The fuse is located just below the power cord socket. Before replacing the fuse, place the Model 1830A front panel power switch to the OFF position and remove power cord on the back of the Model 1830A. To replace the fuse, gently slide out the fuse drawer. Remove the old fuse and snap a new one into the fuse holder. Reinstall the fuse by simply pushing the fuse drawer back into its original position. The fuse drawer should snap into place.

Grounding the Equipment
This product is grounded through the grounding conductor of the power cord.
WARNING To avoid electrical shock or other potential safety hazards, plug the power cord into a properly wired receptacle before using this instrument. The proper grounding of this instrument is essential for safety and optimizing instrument operation.

Danger Arising from Loss of Ground
WARNING If the connection to ground is lost or compromised, a floating potential could develop in the instrument. Under these conditions all accessible parts, including insulating parts such as keypads and buttons could develop a hazardous voltage and put the user at risk.

⚠

List of Items Furnished

Item
Power Cord
User/Maintenance Manual
Statement of Calibration

Table 1.2 - 1830A Packing List

List of Additional Items Required For Operation and Maintenance

Accessory	Part Number
Heater Cable (4 pin mini, 48″ or 15″)	CA-11-48/CA-11-15
Heater Cable (4 pin large, 48″)	CA-10-48
Sensor Cable (478A & 8478B, 48″)	CA-6-48
Sensor Cable (1830A/Legacy Mounts. 48″ or 15″)	CA-7-48/CA-7-15
Sensor Cable (1830A/PM Series Mounts, 48″ or 15″)	CA-21-48/CA-21-15
Universal Cable (Un-terminated, 48″)	CA-9-48
Calibration Cable (Lug-terminated, 48″)	CA-20-48
USB Cable 2 meter (USB A – USB A)	CA-14-2M
Rack Mount Kit (Single Unit)	1830-910
Rack Mount Kit (Dual Unit)	1830-911

Table 1.3 - 1830A Accessory List

Tools and Test Equipment

No special tools and test equipment are needed to operate the 1830A. The follow is a list of thermistor mounts that will operate with the 1830A RF Power Meter.

HP/Agilent	478A, 8478B, S486A, G486A, J486A, H486A, X486A, M486A, P486A, K486A, R486A
TEGAM/Weinschel	1107-7, 1107-8, 1807A, M1110, M1111, M1118, M1120, M1125, M1130, M1135, F1109, F1116, F1117, F1119, F1125, F1130, F1135

Table 1.4 - 1830A Compatible Thermistor Mounts

Preparation for Calibration or Repair Service

Once you have verified that the cause for 1830A malfunction cannot be solved in the field and the need for repair and calibration service arises, contact TEGAM customer service to obtain an RMA, (Returned Material Authorization), number. You can contact TEGAM customer service via the TEGAM website, www.tegam.com or by calling 440.466.6100 (*All Locations*) OR 800.666.1010 (*United States Only*).

The RMA number is unique to your instrument and will help us identify you instrument and to address the particular service request by you which is assigned to that RMA number.

Of even importance, a detailed written description of the problem should be attached to the instrument. Many times repair turnaround is unnecessarily delayed due to a lack of repair instructions or of a detailed description of the problem.

This description should include information such as measurement range, and other instrument settings, type of components being tested, are the symptoms intermittent, conditions that may cause the symptoms, has anything changed since the last time the instrument was used, etc. Any detailed information provided to our technicians will assist them in identifying and correcting the problem in the quickest possible manner. Use a copy of the Repair and Calibration Service form provided on the next page.

Once this information is prepared and sent with the instrument to our service department, we will do our part in making sure that you receive the best possible customer service and turnaround time possible.

Expedite Repair & Calibration Form

Use this form to provide additional repair information and service instructions. The Completion of this form and including it with your instrument will expedite the processing and repair process.

RMA#:		Instrument Model #:	
Serial Number:		Company:	
Technical Contact:		Phone Number:	
Additional Contact Info:			

Repair Instructions:

☐ Evaluation   ☐ Calibration Only   ☐ Repair Only   ☐ Repair & Calibration   ☐ Z540 (Extra Charge)

Detailed Symptoms:
Include information such as measurement range, instrument settings, type of components being tested, is the problem intermittent? When is the problem most frequent? Has anything changed with the application since the last time the instrument was used?, etc.

Warranty Information

TEGAM, Inc. warrants this product to be free from defects in material and workmanship for a period of three years from the date of shipment. During this warranty period, if a product proves to be defective, TEGAM Inc., at its option, will either repair the defective product without charge for parts and labor, or exchange any product that proves to be defective.

TEGAM, Inc. warrants the calibration of this product for a period of one year from date of shipment. During this period, TEGAM, Inc. will recalibrate any product, which does not conform to the published accuracy specifications.

In order to exercise this warranty, TEGAM, Inc., must be notified of the defective product before the expiration of the warranty period. The customer shall be responsible for packaging and shipping the product to the designated TEGAM service center with shipping charges prepaid. TEGAM Inc. shall pay for the return of the product to the customer if the shipment is to a location within the country in which the TEGAM service center is located. The customer shall be responsible for paying all shipping, duties, taxes, and additional costs if the product is transported to any other locations. Repaired products are warranted for the remaining balance of the original warranty, or 90 days, whichever period is longer.

Warranty Limitations

The TEGAM, Inc. warranty does not apply to defects resulting from unauthorized modification or misuse of the product or any part. This warranty does not apply to fuses, batteries, or damage to the instrument caused by battery leakage.

Statement of Calibration

This instrument has been inspected and tested in accordance with specifications published by TEGAM Inc. The accuracy and calibration of this instrument are traceable to the National Institute of Standards and Technology through equipment, which is calibrated at planned intervals by comparison to certified standards maintained in the laboratories of TEGAM Inc.

Contact Information:

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Document publishing dates may lag product changes.
Visit www.tegam.com to download the latest version of this manual.

Unpacking and Inspection

Each 1830A is put through a series of electrical and mechanical inspections before shipment to the customer. Upon receipt of your instrument unpack all of the items from the shipping carton and inspect for any damage that may have occurred during transit. Report any damaged items to the shipping agent. Retain and use the original packing material for reshipment if necessary.

Upon Receipt, inspect the carton for the following items:

Model 1830A RF Power Meter
Model 1830A Operating and Service Manual (CD) P/N 1830A-901-01
Calibration Certificate
Power Cord

Mounting

The Model 1830A is shipped with four feet mounted to the bottom cover. When the Model 1830A is placed on a bench or table, these feet support the instrument. The Model 1830A can also be rack mounted in a standard 19″ rack using the optional rack adapter kit 1830-910 for a single 1830A and kit 1830-911 to rack two 1830A's side-by-side.

NOTE It is recommended to remove all 4 feet prior to rack mounting.

Use in Proper Environment

Normal calibration laboratory practice dictates that the environment should be closely controlled. This will minimize errors introduced by temperature and humidity changes. A nominal temperature as specified in Table 1.1 provides a good working condition. Controlled temperatures also stabilize the aging process of the standards.

Do Not Use in Explosive Environments

CAUTION The 1830A is not designed for operation in explosive environments.

Do Not Block Air Vents on Rear Panel

CAUTION The Model 1830A has an air intake and exhaust on the back panel of the instrument. When installing the Model 1830A, ensure there is at least two inches of space behind the instrument for airflow. DO NOT set the instrument on its rear panel as its airflow will be restricted and may result in damage to the internal circuitry.

Ensure Power Switch is Accessible

CAUTION Ensure that the POWER switch is easily accessible at all times and nothing is in place that would impede proper use.

Do Not Operate Without Covers

WARNING This device should be operated with all panels and covers in place. Operation with missing panels or covers could result in personal injury.

Understanding the 1830A Measurement Process

The Model 1830A RF Power Meter combines a DC substitution balancer with a digital voltmeter system. The use of a A/D converter converts our analog measurement to a digital output on the 1830A front panel. This eliminates the need for any type of analog output that an instrument like the Agilent 432A may require.

Because of the circuit construction, a "four-wire" circuit is used to sense bolometer resistance", allowing the user to use nearly any practical cable length without recalibrating the 1830A.

NOTE Limited by the resistive drop in the source leads. The small currents involved make circuits of 100 meters or more possible, although electromagnetic coupling issues could compromise measurements in some cases.

The balancer is composed of a controllable source that allows current to flow through R_{ref} and the bolometer. Identical precision instrument amplifiers feed the bolometer voltage and the voltage across a reference resistor to a servo-amplifier that has been adjusted for low offset. The servo amplifier controls the main supply transistor and therefore regulates power to the combined reference/bolometer circuit. The 1830A is connected to support NTC devices. When the bolometer voltage is higher than the reference resistor voltage, indicating that the bolometer's resistance is higher than desired, power is increased to heat the bolometer and decrease resistance. When the bolometer voltage is lower than the reference resistor voltage, power is decreased. At balance, the reference resistor voltage and the bolometer voltage match closely. Since their currents are the same, the resistances also match closely.

NOTE The reference resistor is either 100 or 200 Ohms. Additionally, in some modes, the reference resistor voltage is multiplied by a variable to produce the variable resistance feature. At resistances other than 100 or 200 Ohms, the multiplication adds some uncertainty.

The 1830A computes power from changes in the voltage across the reference resistor as follows: When ZERO is pressed, the voltage across the Reference resistor is stored in a combination of DAC settings and software variables. This is done on both the "RF" channel and the "Compensating" channel. For any subsequent readings, the actual values of the voltages are used.

When an uncompensated mode is selected, change in substituted DC power is computed as

$$P = \frac{V_{Off}^2 - V_{On}^2}{R}$$

Equation 1 - Substituted Power Calculation

When a compensated mode is used, change in DC substituted power is computed using the complicated methodology described in the H-P 432 Manual. This gives the identical answer to the uncompensated equation in the case that the compensating thermistors do not have a change in voltage (caused by a change in environment).

Theory of RF Power Measurements

Principles of DC Substitution

Power sensors are not ideal devices, so in order to make good measurements they must be characterized and corrected for. DC substitution is the key for precise RF power measurements. The Model 1830A uses the principle of DC substitution to measure RF power. DC substitution refers to the measurement of RF power according to the amount of DC power that must be substituted for the RF power in a bolometer in order to cause equivalent thermal effects. This is done by monitoring voltage changes of the 1830A's self-balancing bridge circuits.

Power Measurements

The Model 1830A RF Power Meter makes measurements based on a 4-wire technique. The reference resistor R_{Ref} is used to monitor a constant current source that heats the RF sense thermistors in the sensor. Separate sense leads monitor the voltage drop across the thermistors. An error amplifier compares the difference between the voltage drop of R_{Ref} and the voltage drop of the sense thermistors to regulate the constant current source and acts to keep the resistances equal. Once R_{Ref} and the resistance of the sensor are equivalent, the change in the value of V_{RRef} is proportional to the RF energy incident on the sensor.

As RF enters the sensor the constant current source keeps the sensor resistance = R_{Ref} by reducing amount of DC current applied. The Voltage output V_{RRef} is then fed into a programmatic gain amplifier where there is an offset adjustment as shown in Figure 3.1. The ZERO function is also utilized in this section, when the RF power is off (no power at sensor) the offset adjustment creates a voltage that maintains a constant zero reference point (0mW). Once a RF signal is applied the A/D calculates power based on the reference ZERO level.
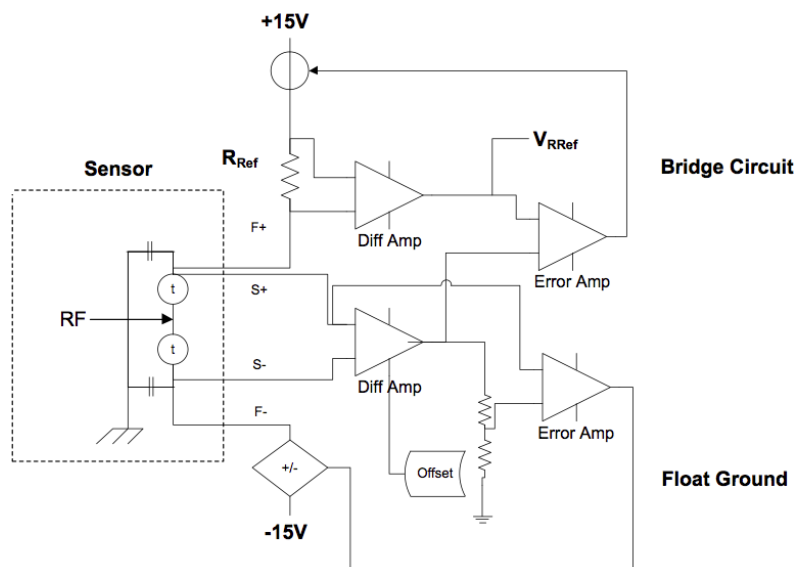

Figure 3.1 - Basic 1830A RF Power Measurement Diagram

Controlling Thermistor Temperature

A thermistor is a temperature-sensitive device. In order to provide precise measurements, the effects of changes in the ambient temperature upon the thermistor must be eliminated or minimized. The Model 1830A temperature controller accomplishes this by raising the TEGAM or Weinschel power standard's internal temperature to a level higher than the ambient temperature (approximately 60° C) and maintaining that level by controlling the current applied to the power standard's heater element. This prevents any thermistor imbalance due to ambient temperature change. Therefore, all temperature changes are due to the application of RF and DC power.

Refer to Figure 3.2 for the following discussions concerning the temperature control circuit. The Model 1830A "bridge" balancer is composed of a controllable source that allows current to flow through R_{ref} and the bolometer. Identical precision instrument amplifiers feed the bolometer voltage and the voltage across a reference resistor to a servo-amplifier that has been adjusted for low offset.
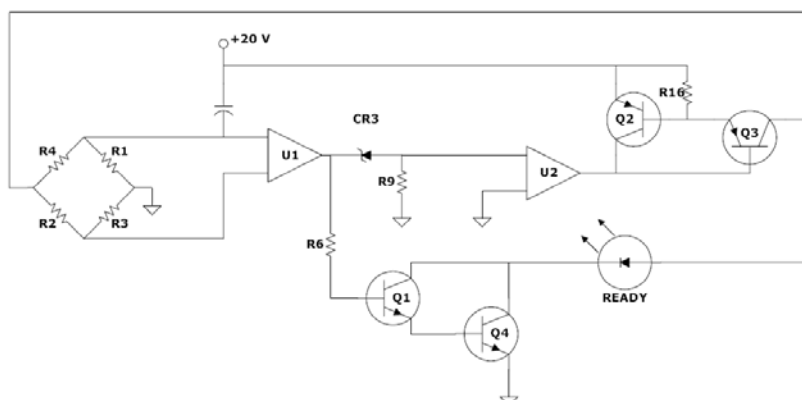
Figure 3.2 - Simplified Schematic of the Model 1830A Heater Circuit

<u>NOTE</u> The reference resistor is either 100 Ω or 200 Ω. Additionally, in some modes, the reference resistance voltage is multiplied by a variable to produce a variable resistance feature. At resistance other the 100 Ω or 200 Ω, the multiplication adds some uncertainty.

The servo amplifier controls the main supply transistor and therefore regulates power to the combined reference/bolometer circuit.

The Model 1830A is designed to support NTC devices. When the bolometer voltage is higher than desired, power is increased to heat the bolometer to decrease resistance. When the bolometer voltage is lower than the reference resistor voltage, power is decreased. At balance, the reference resistor voltage and the bolometer voltage match closely. Since the currents are the same, the resistances also match closely.

The computation of power is determined by the change in voltage across the reference resistor. When ZERO is pressed, the voltage across the reference resistor is stored in a combination of DAC settings and software variables. This is done on both the "RF" channel and the "Compensating" channel. For any subsequent reading, the actual values of the voltages are used.

Start-up Procedure

After unpacking the 1830A and setting up in the proper operating environment, plug in the AC power cord. Do not connect any cables at this point. Press the POWER button located on the lower left side of the 1830A. When the 1830A finishes the power on cycle, it will power into Standby Mode.
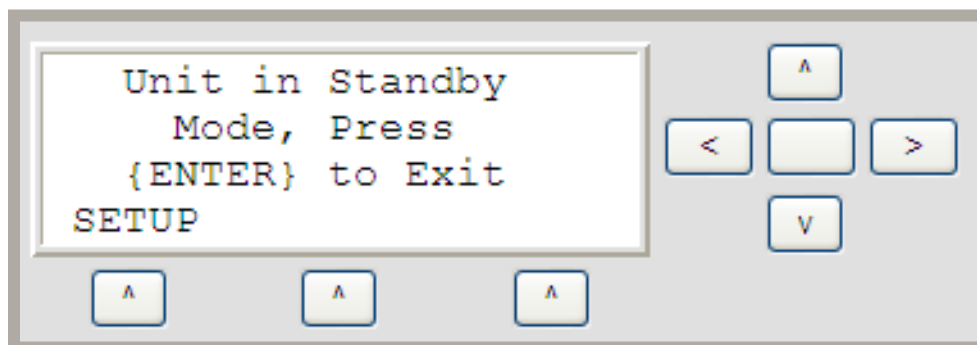
Figure 4.1 1830A Start-up Screen

Standby Mode

The 1830A Standby Mode shuts down measurement capability; minimal current will flow through the sensor. This capability is needed to change sensors and is needed upon initial power up. Because of the 1830A's unique capability to connect to any thermistor mount it is necessary to have different connections. This makes it very important that the 1830A be placed in Standby prior to changing sensors.

There are two suggested ways to place the 1830A in Standby Mode:
- Unit power cycle
- Through the instrument menus

NOTE There is a third way that the instrument will enter Standby Mode. If a sensor is removed the instrument will attempt to refresh the measurement at the normal interval. The instrument will then detect an unbalanced voltage and will prompt the user to place unit in standby. This is not a recommended procedure and should not be the normal way of removing a sensor.

Connecting the Proper Sensor

There are many thermistor based RF power sensors available. The Model 1830A is designed to bias either 100 Ω or 200 Ω mounts and has dual bridges for balancing both RF sense and compensation thermistors such as contained in the Agilent 478A and 8478B. It also is works with the Agilent 486A series of waveguide sensors and includes a heater circuit for all TEGAM and Weinschel ovenized thermistor mounts.

To connect a TEGAM temperature compensated thermistor mount (F1130A, F1130B, F1135A, etc.) the following cables will be needed.

Figure 4.2 - CA-7-48

Sensor Cable (15XX/25XX, 48" or 15")   CA-21-48/CA-21-15
Heater Cable (F113X, 48" or 15")   CA-11-48/CA-11-15
Sensor Cable (F/M113X 48" or 15")   CA-7-48/CA-7-15
Heater Cable (M113X, 48")   CA-10-48

To connect an Agilent model thermistor mount (8478B, S486A, G486A, J486A, H486A, X486A, M486A, P486A, K486A, and R486A) the following cables will be needed.

Figure 4.3 – CA-6-48

Agilent Thermistor:

Sensor Cable (Agilent Mounts, 48")   CA-6-48
These sensors are not ovenized so no heater cable is needed.

1830A Front Panel Menus

SETUP menu
Once all necessary cables are connected enter the SETUP menu. The SETUP menu contains four selections.
1. Standby mode
2. Instrument
3. Cal Factor Tables
4. Maintenance
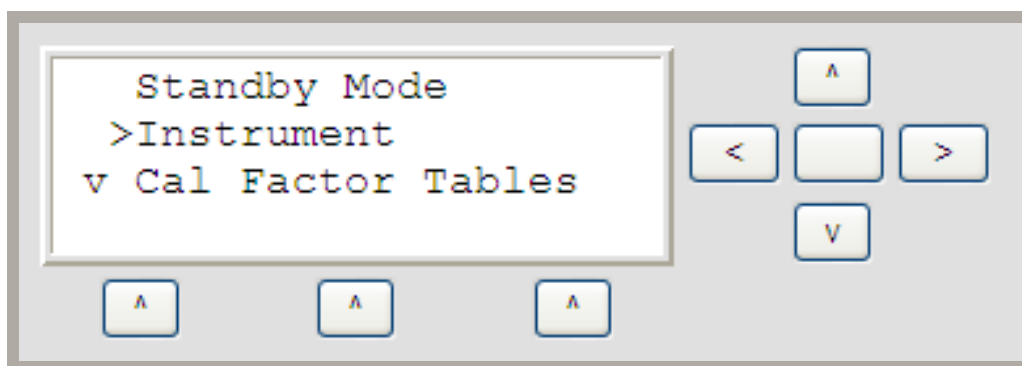
Figure 4.4 SETUP Menu

Standby Mode (Write Only)
Standby is explained above, it is available in the SETUP menu, also the 1830A will power up in standby mode every time.

Instrument Menu
Located in the SETUP menus where all measurement related parameters are set. The Instrument menu contains 11 selections.
1. Range
2. Comp Mode
3. ReZero Unit
4. Network Options
5. Ref Resistor
6. Comp Resistor
7. Read Avgs
8. Display
9. System Temperature
10. Serial Number
11. Firmware Version
12. Analog Brd FW Ver
13. Cal Factor Limit
14. Auto Scale Reading

Range (Read/Write)
Located SETUP—Instrument menu. Select the proper measurement range. There are two possible measurement ranges available on the 1830A:

- 10 mW
- 100 mW

10 mW – This range assumes that power below 10 mW will be measured. Similar to a DMM range selection, the more accurate your range the more accurate the reading. A user could select 100 mW range to measure 1 mW but the reading would be much more accurate in the 10 mW range.

100 mW – This range assumes that power greater than 10 mW will be measured. Similar to a DMM range selection, the user cannot select a range below the desired power measured. 100 mW must be selected for any power above 10 mW.

Comp Mode (Read/Write)
Located SETUP—Instrument menu. Select the proper compensation mode. There are three possible ambient temperature compensation modes available on the 1830A:

- No Compensation
- 432 Compatible
- 432 Bias Comp

No Compensation – To be used with TEGAM thermistor mounts such as the F1130A.

The TEGAM thermistor mount is a type of bolometer whose resistance decreases as a function of increasing heat associated with ambient temperature or applied power. This system also features the Model 1830A temperature control circuitry that temperature stabilizes TEGAM and Weinschel thermistor mounts. This eliminates changes in the thermistor element's resistance due to ambient temperature changes and thus isolates the causes of thermistor variation to the application of RF and DC power only. Therefore compensation for ambient temperature is not needed.

432 Compatible and 432 Bias Comp – To be used with Agilent (HP) temperature compensated thermistor mounts such as the 478A and 8478B.

432 Compatible – This mode assumes that a temperature-compensated mount is attached. The diagnostic and error checking routines monitor both channels for errors, and the voltmeter readings from both channels are combined using the same equation that appears in the HP432 manual for making compensated power measurements using external voltmeters. This mode introduces the uncertainty and noise of two channels, but can compensate for significant environmental swings.

432 Bias Comp – This mode assumes that a temperature-compensated mount is attached. The Bias Comp mode balances both channels just like the 432 Compatible mode, the difference is the voltmeter readings from only Channel 1 are used in the simple power equation of **$P=(V[OFF]^2 - V[ON]^2)/R$**. This method is recommended for standards lab use with 478, 486, 8478 series thermistor mounts, because the errors from only one channel are transferred, while in a lab the mount environment can be stabilized using insulation.

ReZero Unit (Write Only)

Located SETUP—Instrument menu and on the main display window. During rezero the system changes the DAC value to equal the reference resistor value. Since the primary reading is DAC – RV, this creates a zero voltage difference after a re-zero.

Network Options

Located SETUP—Instrument menu. Configure the 1830A remote communication via TCP/IP. The 1830A is controlled via TCP/IP through an Ethernet cable connection. Transmission Control Protocol/Internet Protocol (TCP/IP) is the most popular network protocol and the basis for the Internet. Its routing capabilities provide maximum flexibility in an enterprise-wide network. In Windows XP TCP/IP is automatically installed.
On a TCP/IP network, you must provide IP addresses to clients. Clients may also require a naming service or a method for name resolution. This section explains IP addressing and name resolution for Network Connections on TCP/IP networks. It also describes the FTP and Telnet tools that are provided by TCP/IP.

Network Options menu contains 12 selections.
1. IP Address
2. Subnet Mask
3. Gateway
4. Host Name
5. Domain Name
6. DNS Server 1
7. DNS Server 2
8. MAC Address
9. Network Link Activity
10. LAN Configuration
11. Reset LAN Configuration
12. Network Enable

IP Address (Read/Write):

Located SETUP—Instrument—Network Options menu. Internet Protocol (IP) address is a numerical label that is assigned to devices participating in a computer network, that uses the Internet Protocol for communication between its nodes. An IP address serves two principal functions: host or network interface identification and location addressing.

Subnet Mask (Read/Write):
Located SETUP—Instrument—Network Options menu. Subnet Mask is used to determine what subnet an IP address belongs to. An IP address has two components, the network address and the host address. Subnetting enables the network administrator to further divide the host part of the address into two or more subnets. In this case, a part of the host address is reserved to identify the particular subnet.

Gateway (Read/Write):
Located SETUP—Instrument—Network Options menu. A gateway is a network point that acts as an entrance to another network. On the Internet, a node or stopping point can be either a gateway node or a host (end-point) node. Both the computers of Internet users and the computers that serve pages to users are host nodes. The computers that control traffic within your company's network or at your local Internet service provider (ISP) are gateway nodes.

Hostname (Read/Write):
Located SETUP—Instrument—Network Options menu. A hostname is a label that is assigned to a device connected to a computer network and that is used to identify the device in various forms of electronic communication such as the World Wide Web, e-mail or Usenet. Hostnames may be simple names consisting of a single word or phrase, or they may include the name of a Domain Name System (DNS) domain at the end, that is separated from the host specific label by a full stop (dot). In the latter form, a hostname is also called a domain name.

Domain Name (Read/Write):
Located SETUP—Instrument—Network Options menu. A domain name is a name that identifies one or more *IP addresses*. Domain names are used in URLs to identify particular Web pages.

DNS Server 1 and DNS Server 2 (Read/Write):
Located SETUP—Instrument—Network Options menu. The Domain Name System (DNS) is a hierarchical naming system for computers, services, or any resource connected to the Internet or a private network. It associates various information with domain names assigned to each of the participants. Most importantly, it translates domain names meaningful to humans into the numerical (binary) identifiers associated with networking equipment for the purpose of locating and addressing these devices worldwide.

MAC Address (Read Only):
Located SETUP—Instrument—Network Options menu. A Media Access Control address (MAC address) is a unique identifier assigned to most network adapters or network interface cards (NICs) by the manufacturer for identification, and used in the Media Access Control protocol sub-layer.

Network Link Activity (Read Only):
Located SETUP—Instrument—Network Options menu. This indicator tells you if your network link is active or if there is a fault.

LAN Configuration (Read/Write):
Located SETUP—Instrument—Network Options menu. Select the proper LAN configuration. Select between Automatic IP addressing or manual IP addressing.

Automatic IP Addressing:

DHCP
The 1830A is defaulted to Automatic IP Addressing. This allows for **Dynamic Host Configuration Protocol** (**DHCP**) which is a network application protocol used by devices (*DHCP clients*) to obtain configuration information for operation in an Internet Protocol network. This protocol reduces system administration workload, allowing networks to add devices with little or no manual intervention.

Putting this into practical terms, simply plug the 1830A into your DHCP Ethernet network and it will automatically obtain a IP address and all the necessary network setting to communicate.

<u>Note</u> Please consult you IT professional before connecting to DHCP network.

Auto IP
Another method that can be used to obtain an Automatic IP Address is Auto IP. Auto IP is different from DHCP in that it is a Link-Local configuration. **L**ink-local addresses are often used for network address configuration when no external source of network addressing information is available. This addressing is accomplished by the host operating system using a process known as *stateless address auto configuration*. An example of this would be a laptop PC, if the wireless is being used for network communication the 1830A can be plugged into the wired connection and establish a link only with the laptop. A similar scenario can also be established with two network cards.

Manual IP Addressing:
The 1830A allows for Manual IP Addressing. This allows the user full access to all network parameters. A basic knowledge of manual configuration should be obtained prior to attempting this method.

Reset LAN Configuration (Write Only):
Located SETUP—Instrument—Network Options menu. This control resets all LAN Parameter to the default settings.

Network Enabled (Read Only):
Located SETUP—Instrument—Network Options menu. This indicates if the network is enabled or disabled.

Ref Resistor (Read/Write)
Located SETUP—Instrument—Ref Resistor menu. The reference resistor R_{Ref} is used to monitor a constant current source that heats the RF sense thermistors in the sensor. The reference resistor can be set to 100 Ω or 200 Ω.

NOTE: The reference resistor is either 100 Ω or 200 Ω. Additionally, in some modes, the reference resistance voltage is multiplied by a variable to produce a variable resistance feature. At resistance other the 100 Ω or 200 Ω, the multiplication adds some uncertainty.

Comp Resistor (Read/Write)
Located SETUP—Instrument—Comp Resistor menu. The compensation resistor R_{Comp} is used to monitor a constant current source that heats the RF compensation sense thermistors in the sensor. The compensation resistor can be set to 100 Ω or 200 Ω.

Read Avgs (Read/Write)
Located SETUP—Instrument—Read Avgs menu. This control is defaulted to 1 average, which is equal to 8 ADC averages. For each displayed measurement the ADC is averaged 8 times. Control is available in firmware version 1.1.28a and greater.

Display (Read/Write)
Located SETUP—Instrument—Display menu. This control sets the LCD brightness and LCD contrast.

System Temperature (Read Only)
Located SETUP—Instrument—System Temperature menu. This indicates the system temperature of the 1830A.

Serial Number (Read Only)
Located SETUP—Instrument—Serial Number menu. This indicates the serial number of the 1830A.

Firmware Version (Read Only)
Located SETUP—Instrument—Firmware Version menu. This indicates the current firmware version and firmware date on the 1830A.

Analog Board Firmware Version (Read Only)
Located SETUP—Instrument—Analog Brd FW Ver menu. This indicates the current firmware version and firmware date for the analog board on the 1830A.

Auto Scale Reading (Read/Write)
Located SETUP—Instrument—Auto Scale Reading menu. This control is defaulted to False, all power reading will be displayed in mW. Setting this control to true will show power reading in scaled notation from nW to kW. Control is available in firmware version 1.1.28a and greater.

Cal Factor Limit (Read/Write)
Located SETUP—Instrument—Cal Factor Limit menu. This control limits the maximum cal factor. By default set top 2.0 can be increased beyond 2.0 in firmware version 1.1.28a and greater.

Cal Factor Tables menu
This menu is located in the SETUP menu. This menu allows the user to edit the sensor calibration tables.

Cal Factor Tables menu contains 4 selections.
1. Load Cal Factor Table
2. Edit Cal Factor Table
3. Add Cal Factor Table
4. Delete Cal Factor Table

Load Cal Factor Table (Read/Write)
Located SETUP—Cal Factor Table menu. This control allows the user to see which sensor calibration factor table is already loaded and also allows the user to load a new calibration factor table from memory.

Edit Cal Factor Table (Read/Write)
Located SETUP—Cal Factor Table menu. This control allows the user to see which sensor calibration factor table is already loaded and also allows the user to edit the calibration active table calibration factor table from memory.

Add Cal Factor Table (Read/Write)
Located SETUP—Cal Factor Table menu. This control allows the user to manually add a new calibration table into memory.

Delete Cal Factor Table (Read/Write)
Located SETUP—Cal Factor Table menu. This control allows the user to manually delete a calibration table from memory.

Maintenance Menu
This menu is located in the SETUP menu. This menu allows the user access debug level indicators as well as setup USB communication.

Maintenance menu contains 4 selections.
1. Debug Level
2. Channel 1
3. Channel 2
4. Heater Circuit
5. Max/Min Volts
6. Unit in Cal
7. USB-Serial
8. Cal Limits

Debug Level (Read Only)
Located SETUP—Maintenance menu. This indicator is used to tell the TEGAM developer a digital code that represents a debug level. This indicator is used for development and is not useful to the end user.

Channel 1 and Channel 2 (Read/Write)
Located SETUP—Maintenance menu. These controls and indicators should only be used in a debug process. Most of the indicators are DAC and A/D values. Channel parameters can also be zeroed at this level. The preferred zero method is to use the ReZero located in the root Instrument menu.

Heater Circuit (Read Only)
Located SETUP—Maintenance menu. These indicators monitor the heater voltage and current of the 1830A.

Heater Status (Front Panel Indicator)
The Heater Status is located on the front panel and is used to monitor temperature compensated thermistor sensors.
- Heating – Sensor is connected correctly and is heating properly
- HeatOK – Sensor is at proper regulating temperature. See section 4 for details.
- HtrN/C – Connection between 1830A and Sensor is open or not connected

Max/Min Volts (Read/Write)
Located SETUP—Maintenance menu. These controls should be used with cautions because the set the max and min voltage of the Channel. Defaults are 1.00 V and 4.50 V. Changing these limits could damage a thermistor mount if not carefully monitored.

Max/Min Volts (Read/Write)
Located SETUP—Maintenance menu. These controls should be used with cautions because the set the max and min voltage of the Channel. Defaults are 1.00 V and 4.50 V. Changing these limits could damage a thermistor mount if not carefully monitored.

Unit In Cal (Read Only)
Located SETUP—Maintenance menu. This indicator tells the user that if the 1830A is in calibration mode.

USB-Serial (Read/Write)
Located SETUP—Maintenance menu. The 1830A has two USB 2.0 ports. Only the lower of the two implements a USB slave mode connection, meaning that only the lower port should be used for command interfacing. The connectors are Type "A": a standard A-A USB cable can be used to connect the 1830A to a PC (TEGAM Part Number CA-14-2M). The 1830A will enumerate to Microsoft Windows as a serial port. Therefore, software may interface with the 1830A using simple serial port calls. Additionally, this means that a simple terminal application may be used to test the interface. The same command set and command structure are used on all interfaces. When the instrument is in the remote mode, remote command input has priority over any front panel control. Therefore, as long as a remote interface is continuously active, the front panel keys will appear to be inoperative to the user.

Cal Limits (Read/Write)

Located SETUP—Maintenance menu. This control allows you to set the Cal Warning and Cal Fail limits. These limits will be used during the calibration process for flagging warning and failures.

- Cal Warning (Yellow) – Defaulted to 75%
- Cal Fail (Red) – Defaulted to 100%

NOTE Follow Figure 4.4 in this section to configure the USB port for communication.
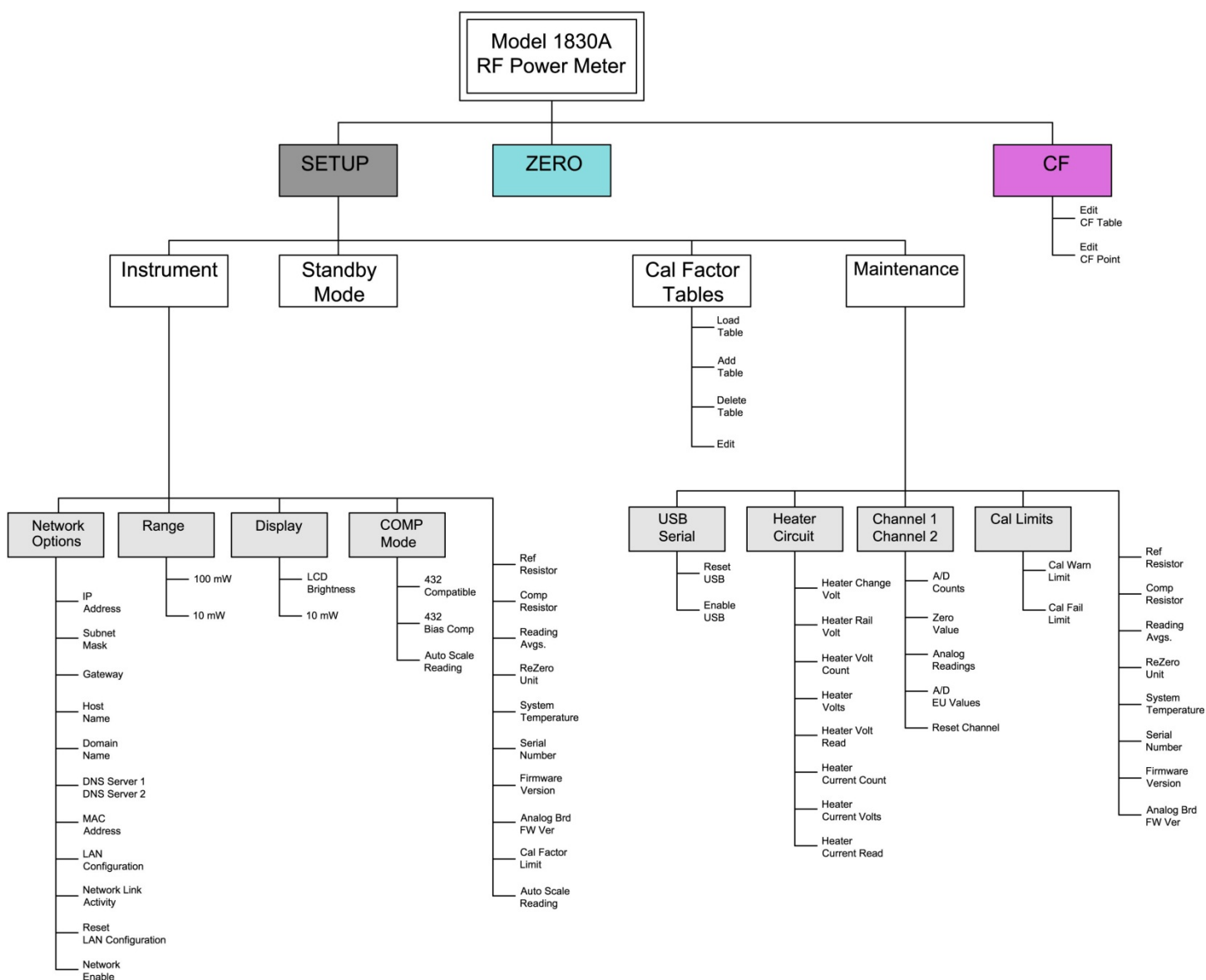
1830A Menus Map

Figure 4.5 - Front Panel Menu Map

Normal Operation

Normal calibration laboratory practice dictates that the environment should be closely controlled. This will minimize errors introduced by temperature and humidity changes. A nominal temperature as specified in Table 1.1 provides a good working condition. Controlled temperatures also stabilize the aging process of the standards.

RF Power Measurement Procedure

Power Measurement with a legacy 478A power sensor

CAUTION: UNDER NO CIRCUMSTANCES APPLY MORE THEN 30 mW TO THE MOUNT[2].

Equipment:
- TEGAM Model 1830A RF Power Meter
- Agilent 478A or 8478B Power Sensor
- Suitable RF Signal Generator (Frequency Range dependent on sensor)
- TEGAM 1830A to Sensor Connector Cable (CA-6-48)

Connections:
1. Plug in all test and measurement equipment
2. Connect specialized TEGAM cable (P/N CA-6-48) to the Model 1830A and Power Sensor[3]
3. Allow necessary warm up time for each piece of equipment[4]
4. Connect RF Source to input of sensor (DO NOT TURN RF ON)

Procedure:
1. Turn RF OUTPUT "OFF" on the RF Signal Generator
2. Using the CF (Calibration Factor) soft-key enter the calibration factor for the desired frequency. (Typically this can be found on the sensor)
3. Using the ZERO soft-key, ZERO the 1830A. (This may take a few seconds)
4. Turn RF OUTPUT "ON" on the RF Signal Generator
5. Read corrected power from the front panel of the Model 1830A[5]

---

[2] This caution pertains to Weinschel type coaxial thermistor bolometers designed to balance at RF off with approximately 30mW. DC Substitution bolometry requires removal of DC to indicate applied power, so application of more RF than there is DC applied originally will inevitably result in an incorrect reading or even overheated thermistor. Refer to the manual of whichever sensor is being used for specific power limits.

[3] This is the point at which the sensor begins to warm up.

[4] The 1830A itself will warm up in approximately one hour, depending on airflow conditions. Please refer to bolometer's manual for warm-up time.

[5] Allow the reading from the 1830A to settle before recording a reading. In most conditions, a few seconds after applying RF is adequate.

**Power Measurement using a TEGAM Terminating Mount (M1130A)
(Refer to all footnotes from 478A procedure)**

<u>CAUTION</u> UNDER NO CIRCUMSTANCE APPLY MORE THEN 30 mW TO THE MOUNT.

Equipment
- TEGAM Model 1830A RF Power Meter
- TEGAM M1130A Terminating Thermistor Mount
- Suitable RF Signal Generator (Frequency Range dependent on sensor)
- TEGAM 1830A to Sensor Connector Cable (CA-7-48)
- TEGAM 1830A to TEGAM Mount Heater Cable (CA-10-48)

Connections
1. Plug in all test and measurement equipment
2. Connect specialized TEGAM cable (P/N CA-7-48) to the Model 1830A and Power Sensor
3. Connect BIAS Connection to model M1130A
4. Connect Heater Cable from 1830A to M1130A (P/N CA-10-48)
5. Allow necessary warm up time for each piece of equipment
6. Connect RF Source to input of sensor (DO NOT TURN RF ON)

Procedure
1. Turn RF OUTPUT "OFF" on the RF Signal Generator
2. Using the CF (Calibration Factor) soft-key enter the calibration factor for the desired frequency.
3. Using the ZERO soft-key, ZERO the 1830A. (This may take a few seconds)
4. Turn RF OUTPUT "ON" on the RF Signal Generator
5. Read calibrated power from the front panel of the Model 1830A

Remote Operation

Remote control of the 1803A is available via two different methods. A command structure that allows for the control and query of all operations is available through Universal Serial Bus (USB) and TCP/IP. The same command set and command structure is used for each and will be explained later in this section. There is also an imbedded LXI web interface that allows for additional control of the instrument for things such as instrument calibration, firmware upgrades, and power senor calibration tables upload. The LXI web interface is only available through the TCP/IP Connection. Refer to Figure 4.1 for location of remote interfaces.
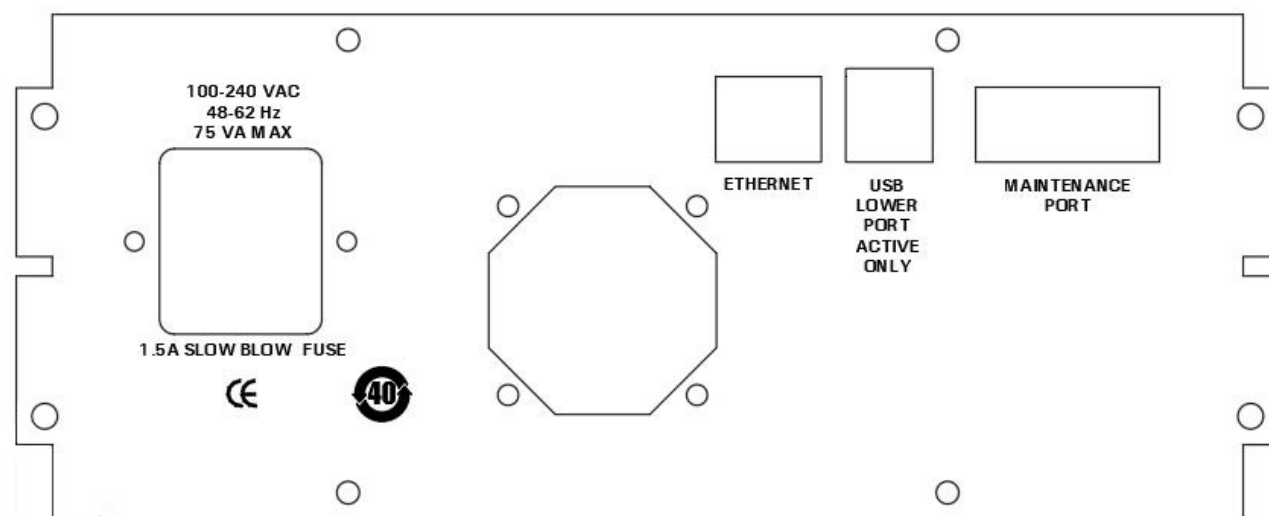
Figure
4.6 - Rear Panel Connections

1830A USB-Serial Configuration

Configuring the 1830A for USB operation is a simple process. Use the flow chart provided in Figure 4.7 and follow these simple steps.

- Download the 1830A USB Driver to your PC. The driver is located on the TEGAM website www.tegam.com.
    - o Navigate to the 1830A resources page and download the 1830A USB driver.
- Using CA-14-2M connect the 1830A using the lower USB port to the PC that will be used to control the 1830A.
- Use the flow chart in Figure 4-3 to set the 1830A for USB-Serial communication.
- Use a terminal application such as HyperTerminal to communicate with your 1830A.
    - o Port settings are 115200 baud, 8 data bits, no parity, 1 stop bit.

```
┌─────────────────────┐
│  Configuring 1830A  │
│      Ethernet       │
└─────────────────────┘
           │
           ▼
     ┌───────────┐
     │   Setup   │
     │   Menu    │
     └───────────┘
           │
           ▼
     ┌───────────┐
     │Maintenance│
     │   Menu    │
     └───────────┘
           │
           ▼
     ┌───────────┐
     │ USB-Serial│
     │   Menu    │
     └───────────┘
           │
           ▼
     ┌───────────┐
     │  Enable   │
     │ USB-Serial│
     │   TRUE    │
     └───────────┘
```
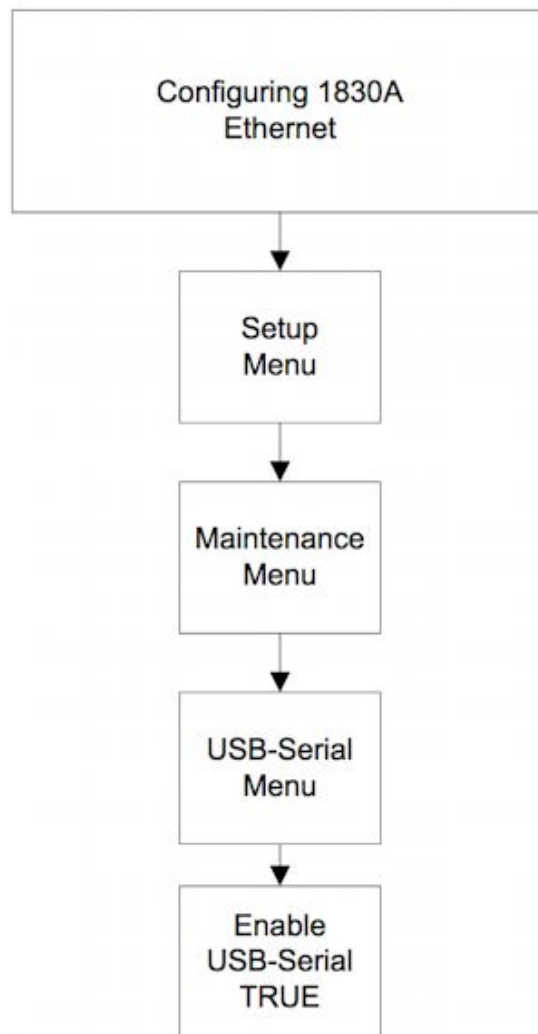
Figure 4.7 - USB-Serial Connection Menu Flow Chart

1830A Ethernet Interface Configuration
Configuring the 1830A to communicate using the Ethernet interface is the preferred method for remote control. One reason for this is that the LXI (LAN eXtensions for Instrumentation) Web interface can be used when users access the 1830A via the Ethernet port. The LXI Web interface provides functionality, such as firmware upgrades, file management, bulk cal factor uploads, and instrument calibration, that is not available when using the USB port.

There are several ways to connect the 1830A to an Ethernet network. Four of the most common configurations are:
1. Connecting to the network using DCHP (*Dynamic Host Configuration Protocol).*
2. *Connecting to the network using a static IP address.*
3. *Connecting to a local network without being connected to a corporate network.*
4. *Connecting directly to the Ethernet port of a PC.*

Connecting to a network using DHCP
When you connect the 1830A to a network using DHCP, you are allowing the network to assign an IP address to your instrument. If the 1830A is connected to the network when you turn it on, it will recognize that it's connected and request that the network assign it an IP address. If you connect the 1830A to the network after it's already turned on, the instrument will request an IP address at that time.

To use this method of connecting to a network, the LAN Configuration must be set to "Automatic IP Addr." To check that this is set up properly, select SETUP -> Instrument -> Network Options -> LAN Configuration from the front panel, then select Automatic IP Addr.

To configure the software that you will use to control the 1830A, or to control the instrument using the LXI Web interface, you will need to know the IP address that the network has assigned to the 1830A. To find that out, select SETUP -> Instrument -> Network Options -> IP Address from the front panel. The 1830A will then display its IP address.

The biggest drawback to connecting to a network using DHCP is that the IP address may change every time you turn off and turn back on the 1830A. Every time the instrument is powered on, it requests an IP address, and the IP address that the instrument had previously may not be available. If that's the case, then the network will assign the 1830A another IP address. Consequently, you'll have to determine what the new address is and reconfigure your software accordingly.

Connecting to a network using a static IP address
One way to avoid the problems associated with DHCP is to have your network administrator assign a static IP address to your 1830A. This is a good solution because your 1830A will have the same IP address no matter how many times that the instrument is turned off and turned back on again.

Once your network administrator assigns an IP address, you will have to configure your 1830A accordingly. First, from the front panel, select SETUP -> Instrument -> Network Options -> LAN Configuration. Then, choose "Manual IP Addr." Then, select SETUP -> Instrument -> Network Options -> IP Addr and enter the assigned IP address.

Connecting to a local network
In the previous two examples, the 1830A is connected to a network which is in turn connected through a gateway to the Internet. Often, network administrators do not permit test instruments to their networks. There are several reasons for this, but the major reason is that they view test instruments as a potential threat to network security.

If this is the situation that you find yourself in, you could set up a local network that's not connected to your organization's network. This can be done with a simple, inexpensive router. Most of these routers use DHCP to assign network addresses to the devices connected to them, so you'll have to configure the 1830A to be in Automatic IP Addr mode as described above.

Connecting to the Ethernet port of a PC
Another way to connect to the 1830A to a PC is to simply connect the Ethernet port of the 1830A directly to the Ethernet port of a PC. To do this, you'll have to configure the 1830A to be in Automatic IP Addr mode as described above.

Once the 1830A and the PC are connected, the PC will assign an IP address to the 1830A. To determine the assigned address, select SETUP -> Instrument -> Network Options -> IP Address from the front panel. The 1830A will then display its IP address. You can then use that address to configure the software that you will use to control the 1830A, or to control the instrument using the LXI Web interface.

Troubleshooting network communications problems
If you are having problems communicating with your 1830A, here are some steps you can take to resolve the problem:
1. Ensure that the Ethernet port of the 1830A is connected to a network or to a computer.
2. Ensure that neworking is enabled. To do this, select select SETUP -> Instrument -> Network Options -> Network Enable from the front panel. If networking is enabled, this value will be "True." If it is not "True", set to by pressing the "Default" button.
3. If you have configured the 1830A to use a static IP address, verify that the IP address of the 1830A is what you expect it to be. To do this, select SETUP -> Instrument -> Network Options -> IP Address from the front panel. The 1830A will then display its IP address.

LXI (LAN eXtensions for Instrumentation)

The 1830A conforms to the LXI (LAN eXtension for Instrumentation) standard for using Ethernet as the communication standard for instrumentation. The LXI standard specifies physical, functional, electrical, and software properties for instrumentation. The 1830A has an Ethernet interface and Web interface, but it does support the trigger or timing functions described in the standard. For more information about the LXI standard and the LXI Consortium, which is the organization that controls and promotes the standard, visit www.lxistandard.org.

LXI Web interface

Once you connect to the 1830A via the Ethernet port, the LXI Web interface becomes a powerful tool. It acts as a front panel to the instrument, allows the user to upload firmware, upload sensor data, manage files, test remote commands and queries, and calibrate the 1830A.

To access the Web interface, open a Web browser, such as Internet Explorer or Firefox, and type the 1830A IP address into the browser command line (for example, 192.168.1.102). To find out what the IP address of your 1830A is, select SETUP -> Instrument -> Network Options -> IP Address from the front panel.

If you have typed in the correct IP address, the 1830A will display its home page as shown in Figure 4.9. At this point, a limited amount of functions are available until you log in.
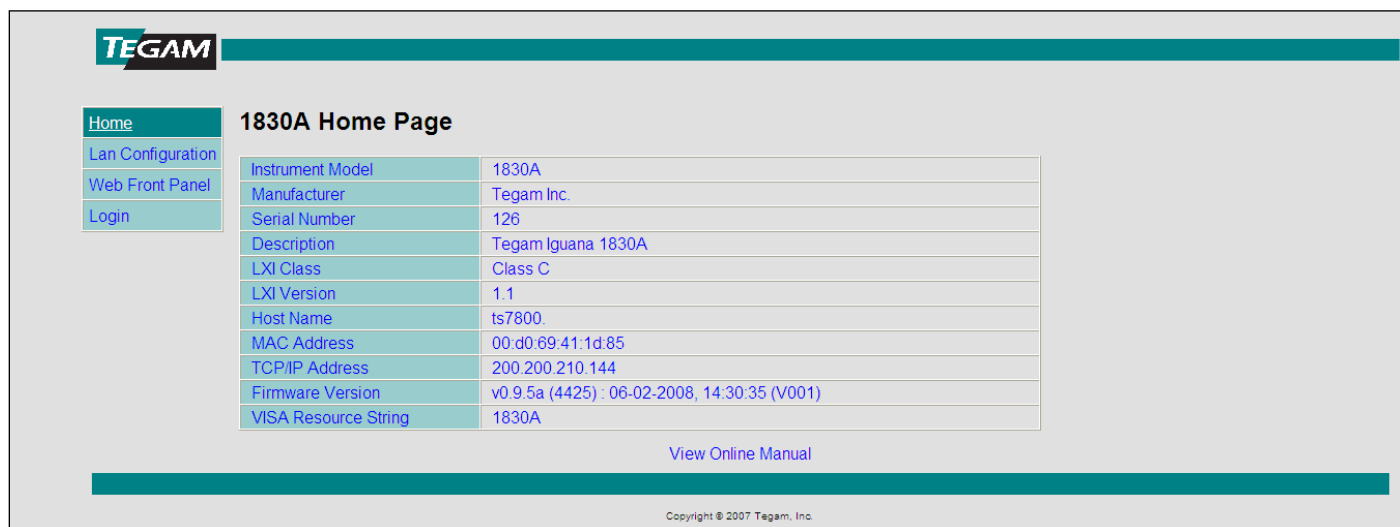

1830A Home Page

Instrument Model	1830A
Manufacturer	Tegam Inc.
Serial Number	126
Description	Tegam Iguana 1830A
LXI Class	Class C
LXI Version	1.1
Host Name	ts7800.
MAC Address	00:d0:69:41:1d:85
TCP/IP Address	200.200.210.144
Firmware Version	v0.9.5a (4425) : 06-02-2008, 14:30:35 (V001)
VISA Resource String	1830A

View Online Manual

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Figure 4.9 - 1830A LXI Home Page

To do this, click "Login," then type your password into the appropriate box on the login screen, as shown in Figure 4.10. The default password is "admin."

Figure 4.10 - 1830A LXI Login

If you have entered the correct password, the 1830A will display the page shown in Figure 4.11. From this screen, much more information and functionality is available to the user.

Figure 4.11 - 1830A LXI Home Page "Login"

Note: Please Read entire manual before exploring the Webpage. Each section of this manual discusses how to use specific functions of the LXI webpage.

1830A Commands

The 1830A can be accessed through a USB interface (as a serial port), or through the LXI Web page (TCP/IP). In either case, you can send commands to the 1830 to read the value of variables, including instrument settings and measurement values, or change settings. Commands are text strings and are not case-sensitive. Commands are made up of multiple words or values sent as a space delimited string.

GET Command

You use the GET command to read the value of system variables and obtain measurements. A list of all available variables are provided in Table 4.4. The command has the following format:

GET {VARIABLE NAME} {ITEM}

Valid {ITEM}s are:
- CURRENT_VALUE or CV. When used with the GET command, the command will return the current value of the variable. If the variable is a measurement, such as POWSUB_1, the 1830A returns a value formatted to four decimal places.
- RAW. When used with the GET command, the command will return an unformatted value of the variable. If the variable is a measurement, such as POWSUB_1, the 1830A returns an unformatted value.
- MIN or MAX. When used with the GET command, the 1830a returns the minimum or maximum value for the variable.
- DEFAULT. When used with the GET command, the command will return the default value of the variable.

GET Command Examples

To read the current value of the power that the 1830A is measuring, send the following command:

GET POWSUB_1 CV

A typical response from the 1830A would be:

00:0.5000 mW

where

00: is a status code that means there were no errors, and
0.5000 mW is the reading.

By comparison, the command GET_POWSUB_1 RAW would return the string:

00: 0.50000000000000000000000000000000

SET Command

You use the SET command to set the value of system variables. A list of all available variables are provided in Table 4.4. The command has the following format:

    SET {VARIABLE NAME} CV {VALUE}

For example, to set the calibration factor to 0.95, issue the command:

    SET K_1 CV 0.9500

If the command was successful, the 1830A will return the string:

    00:0.9500

VARIABLE LIST Command

This command displays a list of all of the 1830A system variables.

VARIABLE CONFIG Command

This command displays a list of all static system variables and their current values. It returns a string that can be used to back up the system.

1830A Error/Status Reporting
A status is returned from the 1830A after each command. Each status, or error code, is comprised of two digits followed by a colon. (i.e. 12:). The error code indicates if there was problem with the command. See Table 4.5 for error codes.

System Commands
System commands (summarized in Table 4.1) are device commands that control the basic functionality of the 1830A. They are similar in fashion to IEE-488.2 Common Commands such as *RST.

Command	Description
*IDN?	Responds with identification of the instrument in SCPI format.
CLOSE or QUIT	Close the current connection to the 1830A. Used only for TCP connections, using these commands with other connection types will have no effect.
SHUTDOWN	Causes the unit to power down. Equivalent to pushing the power button on the front panel when the instrument is on.
RESTART	Causes the unit to reset.
LOCK	Locks out all inputs (front panel, USB and LAN) except the one the LOCK was sent on (USB and LAN). This allows only 1 user to control the system at a time, with no other access allowed. For example, if the LOCK command is sent across the USB, the 1830A will ignore commands from the LAN port as well as the front panel.
UNLOCK	Unlocks the 1830A from dedicated access. Must be issued from the same port that the LOCK command was issued from.

Table 4.1 - Model 1830A System Commands

Sensor Commands

This group of commands is used for adding, editing, and deleting cal factor tables stored in the 1830A.

Command	Description
SENSORS LIST (Query)	Display the list of defined sensors for the system. The list will contain the sensor serial #, Frequency, Units, and K Factor.
SENSORS SELECT {Serial #} {Frequency} {Units}	Loads a specific cal factor table to be used by the 1830A
SENSORS ADD {Serial #} {Frequency} {Units} {K Factor}	Add a new sensor to the list of sensors in the system
SENSORS DELETE {Serial #} {Frequency} {Units}	Delete a specific sensor from the system
SENSORS UPDATE {Serial #} {Frequency} {Units} {K Factor}	Update the K Factor value for a specific sensor

Table 4.2 - Model 1830A Sensor Commands

Front Panel Commands

These commands are used emulate the front panel of the 1830A. These commands would be used if not directly in front of the device or external application automation.

Command	Description
FRONTPANEL UPDATE	Return an ASCII representation of information on the LCD front panel of the device.
FRONTPANEL MENU	Simulate a front panel menu button click
FRONTPANEL UP	Simulate a front panel up button click
FRONTPANEL DOWN	Simulate a front panel down button click
FRONTPANEL LEFT	Simulate a front panel left button click
FRONTPANEL RIGHT	Simulate a front panel right button click
FRONTPANEL FUNC1	Simulate a front panel function key 1 click
FRONTPANEL FUNC2	Simulate a front panel function key 2 click
FRONTPANEL FUNC3	Simulate a front panel function key 3 click

Table 4.3 - Model 1830A Front Panel Simulation Commands

1830A Variable	Description
DEBUGLEVEL	Debug Level
IPADDRESS	IP Address
SUBNETMASK	Subnet Mask
IPGATEWAY	Gateway
SERIALNUMBER	Serial Number
HOSTNAME	Host Name
DOMAINNAME	Domain Name
DNSSERVER1	DNS Server 1
DNSSERVER2	DNS Server 2
MACADDRESS	MAC Address
FIRMWAREVERSION	Firmware Version
DESCRIPTION	User Description
DHCPIP	DHCP Enabled
AUTOIP	Auto IP Enabled
STATICIP	Static IP Enabled
MANUFACTURER	Manufacturer Name
NETWORKLINKACTIVE	Network Link Active
AIN1_RV_1_CNTS	Ref Volt Chan 1 Counts
AIN2_EA_1_CNTS	Err Amp Ref Volt Counts
AIN3_KV_1_CNTS	Gain Adj for Ref Volt Counts
AIN4_BV_1_CNTS	Bolometer Voltage Counts
AIN5_FG_1_CNTS	Float Gnd Err Volt Counts
AIN6_TEMP_1_CNTS	Temp Signal Counts
AIN1_RV_1	Ref Volt Chan 1
AIN2_EA_1	Err Amp for Ref Volt
AIN3_KV_1	Gain Adj for Ref Volt
AIN4_BV_1	Bolometer Voltage
AIN5_FG_1	Float Gnd Err Volt
AIN6_TEMP_1	Temp Signal
DAC_1	DAC Voltage
R_1	Ref Resistor
POWSUB_1	Substituted Power
POWSUBK_1	Substituted Power * K
K_1	Cal Factor
DAC_Z_1	Dac Voltage Counts
DAC_Z_F_1	Dac Voltage
AIN_RV_FINE_Z_1	Ref. Volt Fine Zero Cnts
AIN_RV_FINE_Z_F_1	Ref. Volt Fine Zero
AIN_RV_FINE_1	Ref. Volt Fine Cnts
AIN_RV_FINE_F_1	Ref. Volt Fine

REZERO_SYSTEM	Trigger a system Rezero
LOCKTIME	System lock time in minutes
TEMPERATURE_1	System Temperature
CURRENT_SENSOR	Current Sensor being used
FV	Short firmware version
ANA_FV_1	Analog board firmware version
ANA_FV_2	Analog board firmware version
AB_BV_DAC_1	BV DAC Setting
AB_RV_GAIN_1	RV Channel Gain Setting
AB_RV_OFFSET_1	RV Channel Offset Setting
AB_BV_GAIN_1	BV Channel Gain Setting
AB_BV_OFFSET_1	BV Channel Offset Setting
AB_DAC_GAIN_1	DAC Channel Gain Setting
AB_DAC_OFFSET_1	DAC Channel Offset Setting
AB_DAC_RV_GAIN_1	DAC RV Channel Gain Setting
AB_DAC_RV_OFFSET_1	DAC RV Channel Offset Setting
AB_100_RESISTANCE_1	100 Ohm Channel Calcd Resistance
AB_200_RESISTANCE_1	200 Ohm Channel Calcd Resistance
AB_RESISTANCE_GAIN_1	Custom Resistor Channel Gain Setting
AB_RESISTANCE_OFFSET_1	Custom Resistor Channel Offset Setting
AB_BV_DAC_1_OLD	BV DAC Setting
AB_RV_GAIN_1_OLD	RV Channel Gain Setting
AB_RV_OFFSET_1_OLD	RV Channel Offset Setting
AB_BV_GAIN_1_OLD	BV Channel Gain Setting
AB_BV_OFFSET_1_OLD	BV Channel Offset Setting
AB_DAC_GAIN_1_OLD	DAC Channel Gain Setting
AB_DAC_OFFSET_1_OLD	DAC Channel Offset Setting
AB_DAC_RV_GAIN_1_OLD	DAC RV Channel Gain Setting
AB_DAC_RV_OFFSET_1_OLD	DAC RV Channel Offset Setting
AB_100_RESISTANCE_1_OLD	100 Ohm Channel Calcd Resistance
AB_200_RESISTANCE_1_OLD	200 Ohm Channel Calcd Resistance
AB_RESISTANCE_GAIN_1_OLD	Custom Resistor Channel Gain Setting
AB_RESISTANCE_OFFSET_1_OLD	Custom Resistor Channel Offset Setting
AB_BV_DAC_2	BV DAC Setting

AB_RV_GAIN_2	RV Channel Gain Setting
AB_RV_OFFSET_2	RV Channel Offset Setting
AB_BV_GAIN_2	BV Channel Gain Setting
AB_BV_OFFSET_2	BV Channel Offset Setting
AB_DAC_GAIN_2	DAC Channel Gain Setting
AB_DAC_OFFSET_2	DAC Channel Offset Setting
AB_DAC_RV_GAIN_2	DAC RV Channel Gain Setting
AB_DAC_RV_OFFSET_2	DAC RV Channel Offset Setting
AB_100_RESISTANCE_2	100 Ohm Channel Calcd Resistance
AB_200_RESISTANCE_2	200 Ohm Channel Calcd Resistance
AB_RESISTANCE_GAIN_2	Custom Resistor Channel Gain Setting
AB_RESISTANCE_OFFSET_2	Custom Resistor Channel Offset Setting
AB_BV_DAC_2_OLD	BV DAC Setting
AB_RV_GAIN_2_OLD	RV Channel Gain Setting
AB_RV_OFFSET_2_OLD	RV Channel Offset Setting
AB_BV_GAIN_2_OLD	BV Channel Gain Setting
AB_BV_OFFSET_2_OLD	BV Channel Offset Setting
AB_DAC_GAIN_2_OLD	DAC Channel Gain Setting
AB_DAC_OFFSET_2_OLD	DAC Channel Offset Setting
AB_DAC_RV_GAIN_2_OLD	DAC RV Channel Gain Setting
AB_DAC_RV_OFFSET_2_OLD	DAC RV Channel Offset Setting
AB_100_RESISTANCE_2_OLD	100 Ohm Channel Calcd Resistance
AB_200_RESISTANCE_2_OLD	200 Ohm Channel Calcd Resistance
AB_RESISTANCE_GAIN_2_OLD	Custom Resistor Channel Gain Setting
AB_RESISTANCE_OFFSET_2_OLD	Custom Resistor Channel Offset Setting
R_2	Comp Resistor
POWSUB_2	Substituted Power
POWSUBK_2	Substituted Power * K
K_2	Cal Factor
DAC_Z_2	Dac Voltage Counts
DAC_Z_F_2	Dac Voltage
AIN_RV_FINE_Z_2	Ref. Volt Fine Zero Cnts
AIN_RV_FINE_Z_F_2	Ref. Volt Fine Zero
AIN_RV_FINE_2	Ref. Volt Fine Cnts

AIN_RV_FINE_F_2	Ref. Volt Fine
AIN1_RV_2_CNTS	Ref Volt Chan 1 Counts
AIN2_EA_2_CNTS	Err Amp Ref Volt Counts
AIN3_KV_2_CNTS	Gain Adj for Ref Volt Counts
AIN4_BV_2_CNTS	Bolometer Voltage Counts
AIN5_FG_2_CNTS	Float Gnd Err Volt Counts
AIN6_TEMP_2_CNTS	Temp Signal Counts
AIN1_RV_2	Ref Volt Chan 1
AIN2_EA_2	Err Amp for Ref Volt
AIN3_KV_2	Gain Adj for Ref Volt
AIN4_BV_2	Bolometer Voltage
AIN5_FG_2	Float Gnd Err Volt
AIN6_TEMP_2	Temp Signal
TEMPERATURE_2	System Temperature
AIN0_DAC_1_CNTS	DAC Ref Volt Counts
AIN0_DAC_1	DAC Ref Volt
AIN0_DAC_2_CNTS	DAC Ref Volt Counts
AIN0_DAC_2	DAC Ref Volt
RV_READING_RANGE	Gain range for primary reading
COMPENSATION_MODE	Compenstation Mode
DIAG_POWER_1	Diagnostic Power Calculation 1
DIAG_POWER_2	Diagnostic Power Calculation 2
HEATER_VOLTAGE_CNTS	Heater Voltage ADC Counts
HEATER_VOLTAGE_VOLTS	Heater Voltage ADC Volts
HEATER_VOLTAGE_VALUE	Heater Voltage Reading
HEATER_CURRENT_CNTS	Heater Current ADC Counts
HEATER_CURRENT_VOLTS	Heater Current ADC Volts
HEATER_CURRENT_VALUE	Heater Current Reading
IN_CALIBRATION	Unit in Calibration
MAX_CHANNEL_VOLTAGE	Maximum Allowed Voltage On Channel
MIN_CHANNEL_VOLTAGE	Minimum Allowed Voltage On Channel
IN_STANDBY	System In Standby Mode
AB_DAC_RV_LOW_GAIN_1	DAC RV Channel Low Gain Setting
AB_DAC_RV_LOW_OFFSET_1	DAC RV Channel Low Offset Setting
AB_DAC_RV_LOW_GAIN_2	DAC RV Channel Low Gain Setting
AB_DAC_RV_LOW_OFFSET_2	DAC RV Channel Low Offset Setting

VOLT_ERR_PERCENT	Max. Voltage Error
ZEROING_SERVO_LOOP	Status of ZEROSERVOLOOP function
DO_ZEROSERVO_1	trigger ZEROSERVOLOOP function
DO_ZEROSERVO_2	trigger ZEROSERVOLOOP function
CURRENT_STATE	Current state machine value
CURRENT_STATE_TEXT	Current state machine value
AB_DAC_RV_LOW_GAIN_1_OLD	DAC RV Channel Low Gain Setting
AB_DAC_RV_LOW_OFFSET_1_OLD	DAC RV Channel Low Offset Setting
AB_DAC_RV_LOW_GAIN_2_OLD	DAC RV Channel Low Gain Setting
AB_DAC_RV_LOW_OFFSET_2_OLD	DAC RV Channel Low Offset Setting
LAN_RESET	Reset Lan Configuration
USB_ENABLE	Enable USB
USB_RESET	Reset USB
AB_DAC_20_GAIN_1	Dac 20 Gain Value
AB_DAC_20_OFFSET_1	Dac 20 Offset Value
AB_DAC_20_GAIN_1_OLD	Dac 20 Gain Value
AB_DAC_20_OFFSET_1_OLD	Dac 20 Offset Value
AB_DAC_20_GAIN_2	Dac 20 Gain Value
AB_DAC_20_OFFSET_2	Dac 20 Offset Value
AB_DAC_20_GAIN_2_OLD	Dac 20 Gain Value
AB_DAC_20_OFFSET_2_OLD	Dac 20 Offset Value
STOP_ZERO_SERVO_LOOP	Stop Zero Servo Loop
NETWORK_IDENTIFY	Identify Device On Network
LAN_CONFIGURATION	LAN Configuration
CHAN_1_RESET	Reset Channel 1
CHAN_2_RESET	Reset Channel 2
BALANCE_VOLT_ERR	Balance Volt. Error
BALANCE_VOLTAGE_1	Balance Voltage
BALANCE_VOLTAGE_2	Balance Voltage
ENABLE_OPEN_WIRE_DETECT	Enable Open Wire Detection
NETWORK_ENABLED	Network Enable
READING_AVERAGES	Reading Averages

Table 4.4 - List of SET and GET Variables for the 1830A

Error Code	Description
00	No Error
10	Bad Command The command sent was not recognized by the system
11	Bad Variable Name The variable name used was not recognized by the system
12	Bad Item Name The item name used was not recognized by the system
13	Buffer size error System buffers are not large enough to handle the request
14	Read Only The value that was attempted to be set, is read only
15	Format Wrong The command format is incorrect
16	Bad Variable Index The variable index is invalid
17	File Not Open An attempt was made to write to a file that was not open
18	Thread Start Fail A thread in the system failed to start correctly
19	Bad Variable Type The variable type accessed is invalid
20	Serial Port Failed The system failed to connect to or open the specified serial port
21	TCP Port Failed The system failed to bind to the specified serial port
22	Service Failed The system failed to start the specified service
23	Failed to Open Memory The system failed to open the required memory access
24	DIO Failed The system failed to initialize the DIO ports
25	Value Out Of Range The passed value is out of range for the system
26	Invalid Username The username used to login to the system is invalid
27	Invalid Password The password used to login to the system is invalid
28	System Is Locked The system is currently locked to all access by another user
29	Sensor Serial Number Length To Long

Error Code	Description
	The passed sensor serial number length is too long. The maximum length is 18 characters
30	Invalid Value A passed value is invalid
31	Duplicate Record Another record with these values already exists
32	No Record No record was found with the requested values
33	User Not Administrator An operation was attempted that can only be done by an administrator
34	User Already Logged In Another user is already logged in
35	Serial Port Time Out Communications on the serial port timed out
36	DEBUG ERROR
37	Invalid menu keypress
38	Cannot Set IP address
39	Programming Failure
40	There are active errors and return value may not be valid
41	Invalid Data
42	Invalid Trigger Variable
43	Unbalanced Voltage
44	Voltage Error
45	Power Under Load
46	Power Over Load
47	Error while in calibration state
48	System in Standby
49	System is zeroing
50	Lock Failed
51	Fork Failed
52	Fork Application Failed
53	Bad File
54	Invalid calibration
55	OWD Check in Process

Table 4-5 - Error Codes

Sensor Calibration File Upload

The 1830A allows users to upload sensor calibration data for multiple sensors at one time through the LXI webpage.

NOTE: A file size of 5000 rows in excel was tested for this document. Tins will allow for 25 sensors with 200 data points each. More sensors can be added but each line adds processing time and load time.

Connections

- Plug in 1830A.
- Allow necessary warm up time for each piece of equipment.

Steps for uploading a calibration file

1. Create a "sensors" file:
   - File must be in .csv format.
   - Sensor #Serial Number can be any alpha-numeric format.
   - All frequencies must be greater than 1. (100KHz not .1MHz)
   - All cal factors must be in decimal format and less than 2.00[6].

	A	B	C	D	E
1	# 1830A Sensor Configuration Data				
2	# Serial Number	Frequency	Units	K Factor	
3	F1130A-2779	100	KHZ	0.9991	
4	F1130A-2779	200	KHZ	0.9952	
5	F1130A-2779	300	KHZ	0.9949	
6	F1130A-2779	455	KHZ	0.9963	
7	F1130A-2779	500	KHZ	0.9967	
8	F1130A-2779	1	MHZ	0.9968	
9	F1130A-2779	1.25	MHZ	0.9968	
10	F1130A-2779	3	MHZ	0.996	
11	F1130A-2779	5	MHZ	0.9971	
12	F1130A-2779	10	MHZ	0.9942	
13	F1130A-2779	20	MHZ	0.9941	
14	F1130A-2779	30	MHZ	0.9943	
15	F1130A-2779	40	MHZ	0.994	

Figure 4.13 - Sample Sensor Data File (sensors.csv)

---

[6] By default the calibration factor is limited to 2.00. With firmware version 1.1.28a and greater calibration factors of greater than 2.0 can be set.

Upload sensors.csv via the LXI webpage
- Open the LXI webpage with a web browser.
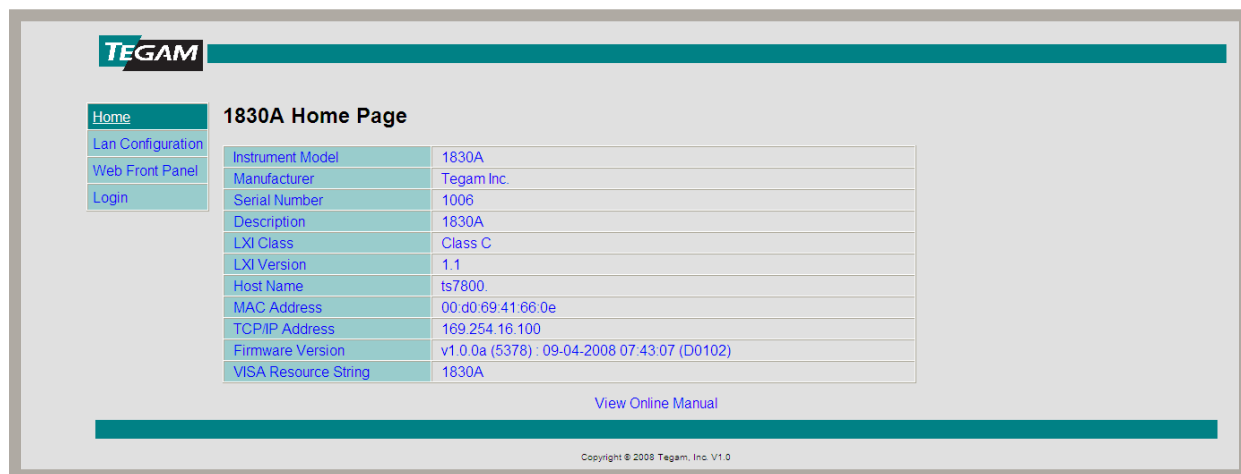
Figure 4.14 - LXI Home Page

- Login to the LXI webpage. (Password is admin)
- Navigate to Sensor Data page.
- Browse to the file created and upload file. (This may take several seconds depending on file size)
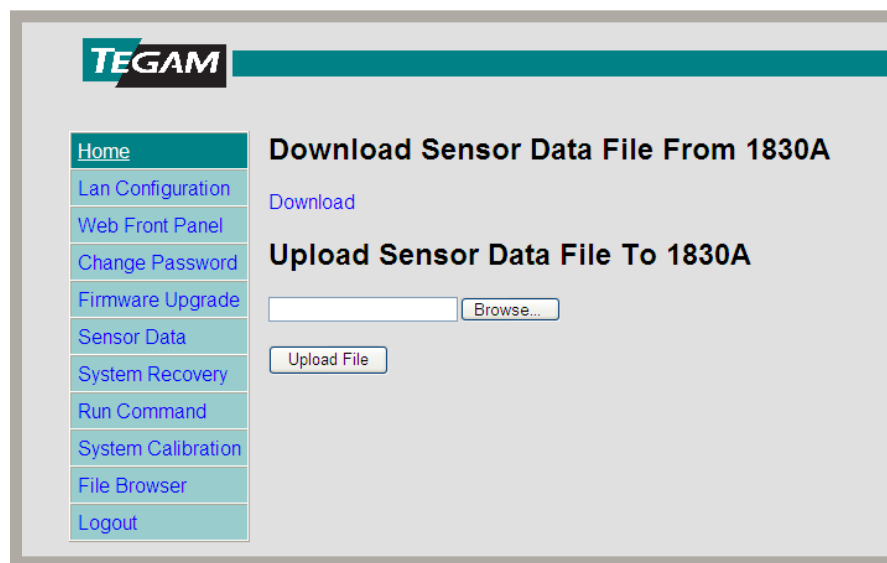

Figure 4.15 - Upload Sensor Data File

Heater Circuit Operation

The 1830A heater circuit operates by applying a heating voltage to the mount, until the mount temperature bridge stabilizes. The heater circuit will then reduce the voltage to a regulating voltage to maintain the mount temperature.

The figure shows how heater voltage and current change over time, along with the DC substituted power change reading of a mount warming up. The sharp step down in voltage and current indicates that the input body temperature has entered the regulation zone, and that the regulator has transitioned from warming as quickly as possible to controlling temperature. The flattening of the DC substituted power at the same time shows that the zero reading of the thermistor mount changes much more slowly once the heater is in regulation.

The model 1830A, after firmware version 1.1.36a, tries to detect the step down in voltage to raise the 'Htr OK' indicator. This was changed from earlier versions that raised 'Htr OK' at fixed current levels, and as a result sometimes did not ever indicate 'Htr OK'. Detection is by means of identifying the "rail voltage" during start-up, and then finding a step down of a user-selectable amount that is defaulted to be 0.6 Volts.

If the 1830A front panel heater status indicator does not change to 'Htr OK' after a 2 hour warm up, the selected step size may be too large. A very small number of thermistor mounts may enter regulation with a voltage that is less than 0.6 V below the "rail". If this rare condition occurs, first find the voltage and current of the heater when that mount is cool. Then observe the voltage for approximately one hour. If the mount will regulate, the voltage will drop by some amount. If you see a drop into regulation, note the size of the drop and the voltage at which the mount is regulating. The access to view the heater voltage is SETUP->Maintenance->Heater Circuit->Heater Volt Read. You can calculate a new step size from

change voltage = (rail voltage – regulating voltage – 0.2)

The access to change the step size is, SETUP->Maintenance->Heater Circuit->Heater Change Volt.

Please note that the 'Htr OK' notification only signals that the heater has changed to its regulation voltage. It is not an indication that the mount is ready to make measurements. The zero reading does continue to change by microwatts for some time after the heater starts regulating, as a result of the distribution of heat in the input body continuing to even out. TEGAM recommends a two-hour warm-up with heater and thermistor beads connected, if starting at laboratory temperature. If starting from storage temperature, TEGAM recommends a 24-hour soak at laboratory temperature before beginning warm-up. After the heater is regulating, the BEST indication that the mount is ready for accurate use is that the zero reading remains stable within a few microwatts for several minutes.

1830A Heater Regulation Chart
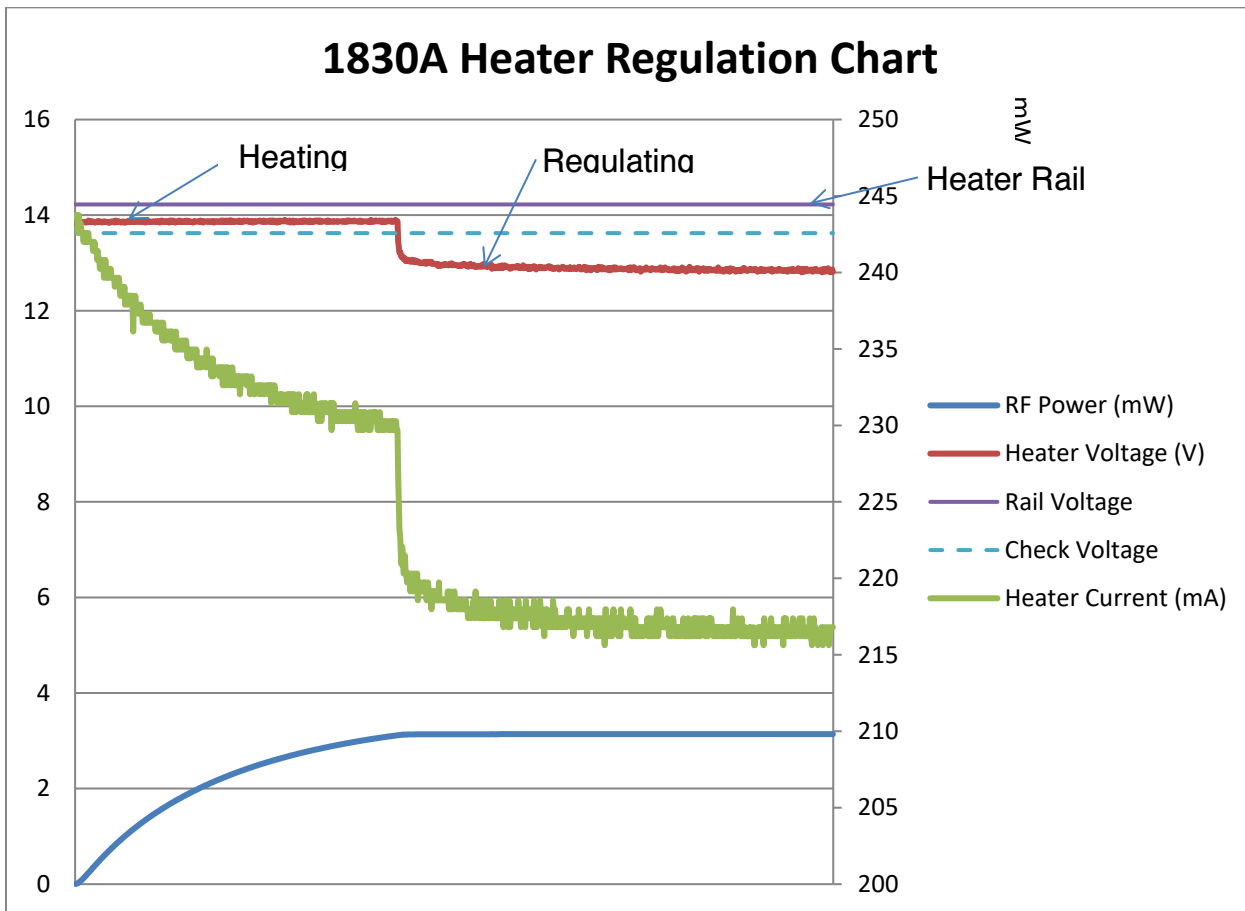
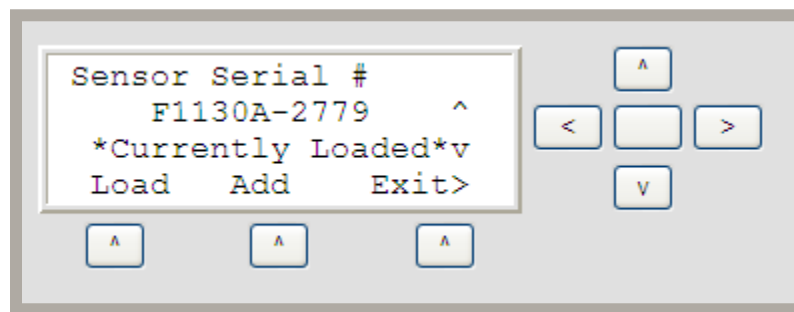2. Sensor calibration tables now appear on 1830A.

Figure 4.16 - Loaded Sensor Data

Normal Shutdown Procedure

Press the power button will start the normal shut down procedure. Shutdown will take several seconds to insure proper shutdown has occurred. Do not unplug the 1830A until the LCD goes black and fan stop indicating shutdown is com

1830A System Calibration and Diagnostics

The calibration of the 1830A is a web based process and requires a LXI connection. Please refer to Section IV of this manual for instructions on how to make a LXI connection.

The 1830A offers two different options; calibration and verification. One method simply verifies a calibration and one method follows the same procedures but at the end of the procedures allows the user to save the calibration data to the 1830A.

- Diagnostics - Used to check performance verification as well as how much the unit may have drifted from the last calibration values. Each test can be performed individually.
- Calibration - Performs a full system calibration on the both analog channels in the unit.

<u>Note:</u> **The Diagnostic option is an excellent way to become familiar with the calibration process without risk of overwriting previous data.**

<u>Note:</u> **All of the calibration procedures are located internal to every 1830A and are accessible through the LXI webpage. This section will list all of the calibration procedures and will give an example of the first step. Please note that this example may be slightly different from what the user may see on the LXI webpage because firmware versions change some of the wording and diagrams.**

Calibration and Verification Equipment

Below is a list of the equipment needed to perform an 1830A calibration.

1. Source requirement: Source shall be capable of delivering a stable (change per minute less than 1% of total error in lab temperature conditions) voltage of between 0.5V and 4.5V DC into 100 Ohms.

2. Voltage measure requirement: Voltage sourced across the resistor can be EITHER set on an accurate stable calibrator such as FLUKE 5720A or set on a stable source and read using a voltmeter. In either case, use the same range for every voltage (10 or 11 Volt Range suggested). Use a calibrator or Voltmeter so that total 95% confidence uncertainty for the following voltage requirements.

- Volts at 0.5 V within   3.66666E-05 V
- Volts at 4.5 V within 11.66666E-05 V

3. Resistance requirement: When a 100-Ohm or 200-Ohm resistor is required, attach a resistor whose value is within 1% of the required nominal value, and whose value is known with a 95% confidence uncertainty to within 0.004133334 Ohms for the 100-Ohm resistor and 0.009333334 Ohms for the 200-Ohm resistor. This can be achieved by using a stable resistor calibrated to the required accuracy OR using a precision resistor that is measured to within the required accuracy using a precision Ohmmeter before use. If the second method is used, long-term drift and temperature coefficient of the resistor may not need to be included in the uncertainty estimate.

Calibration Environment
Calibration and verification should be performed in laboratory operating conditions as stated in Section I; Table 1.1. Allow 1830A to warm up for at least one hour before calibration.

Disassembly of 1830A
There is no disassembly required for calibration of the 1830A. The 1830A should remain fully assembled during the calibration process.

Calibration and Diagnostic Process
Both the calibration and diagnostic performs the same process on both channels. However; the calibration is more automated and controlled then the diagnostic. Table 5.1 Lists all of the calibration/diagnostic procedures.

Calibration Process	Process Definition
Zero the Servo Loop	This operation is done to eliminate any difference between the voltages across the bolometer and reference resistor when the loop is balanced.
Calibrate the ADC for Reading BV and RV	This operation is done to determine any gain or offset values in the bolometer and reference resistor voltages.
Calibrate the Auto-Zero DAC	This operation is done to determine any gain or offset values in the offset DAC voltage.
Calibrate the ADC for reading DAC-RV at high gain	This operation is done to determine any gain or offset values in the DAC-RV reading of the ADC, at high gain.
Calibrate the ADC for reading DAC-RV at low gain	This operation is done to determine any gain or offset values in the DAC-RV reading of the ADC, at low gain.
Calibrate 100-Ohm Reference Resistor	This operation is done to measure the actual resistance value of the analog channel 100 Ohm resistor.
Calibrate 200-Ohm Reference Resistor	This operation is done to measure the actual resistance value of the analog channel 200 Ohm resistor.
Calibrate the Gain Adjust Channel	This operation is done to measure the slope and offset values for the custom resistance setting.

Table 5.1 - Calibration Process

1830A Diagnostic Initiate

To initiate a diagnostic process establish a LXI web session as described in Section IV (Operating Instructions). Select System Calibration from the LXI web menu (Refer to Figure 5.1). Select Engineering Diagnostics/Verification.

Figure 5.1 - System Calibration Webpage (Diagnostics)

1830A Diagnostic Channel Select

Once Engineering Diagnostics/Verification is selected use the continue button to select the channel of interest; either Channel 1 or Channel 2 (Refer to Figure 5.2). Diagnostics gives individual channel control that is not available in the full calibration.

Figure 5.2 - Diagnostic Channel Selection

1830A Diagnostic Procedure

Once a channel is selected the user will select a procedure (Refer to Figure 5.3). Each step will lead user through connection diagrams and detailed instructions to accurately complete the selected step. Refer to figures 5.4 & 5.5 for an example of what these screens contain.
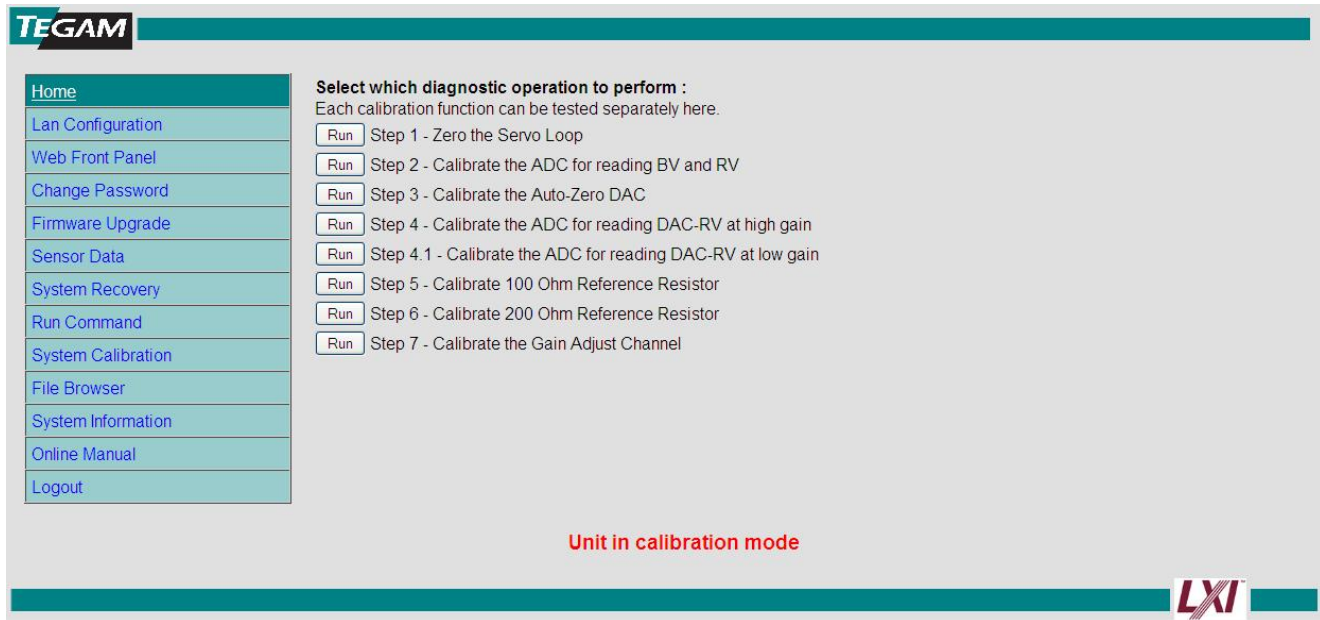
Figure 5.3 - Diagnostic Operation Selection
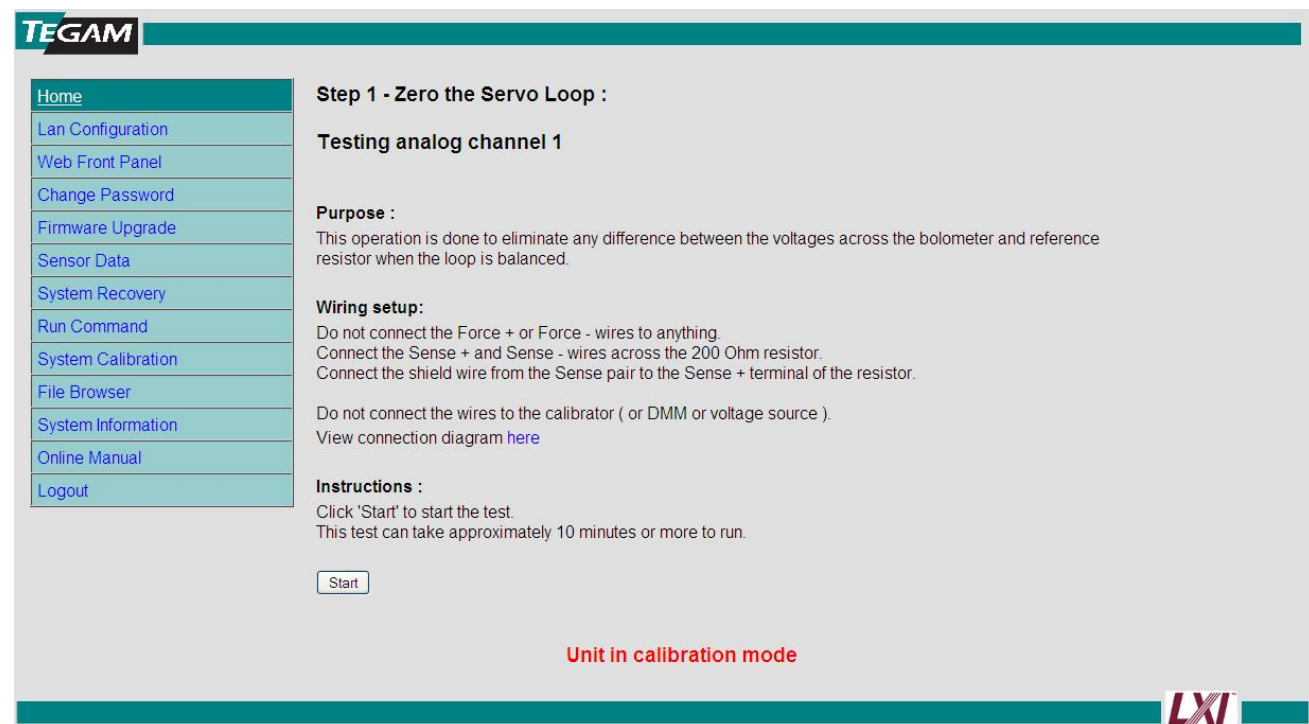
Figure 5.4 – Zero Servo Loop

Note: Each calibration and diagnostic step allows the user to view a connection diagram. Figure 5.5 is an example of the diagram. This manual will not contain all the connection diagrams because they are available on the LXI webpage.

Model 1830A RF Power Meter
Calibration Connection Arrangement

Channel 1 Offset Calibration
Calibration Step 1 for Channel 1

RESISTANCE
IET LABS HARS-LX-9-0.001
OR EQUAL

Set Resistance to 200 Ohms for Offset Cal

MULTIPURPOSE CALIBRATOR
FLUKE 5720 OR EQUAL

CHASSIS
CURRENT LO
SENSE LO
SENSE HI
CURRENT HI

OUTPUT
SENSE
AUX
LO
HI
GUARD
LO
HI
GROUND

CH2 SENSE
YELLOW
CH2 FORCE
BROWN
CH1 SENSE
ORANGE
CH1 FORCE
RED

SHIELD
RED +
BLK -

↓ TO 1830A FRONT PANEL ↓

CA-8-XX
or
CA-20-XX

DWG NO
1830A-920-01

SHEET
2 OF 8

SCALE
1:1

SIZE
A

REV
A

REV. | 0 | A
DESCRIPTION | DRAFT | Corrections
DATE | 16 FEB 07 | 23 APR 09
BY | ASB | ASB

23 APR 2009

Figure 5.5 – Zero Servo Loop Connection Example Schematic

1830A Calibration Initiate

To initiate a calibration establish a LXI web session as described in Section IV. Select System Calibration from the LXI web menu (Refer to Figure 5.6). Select Perform Calibration.
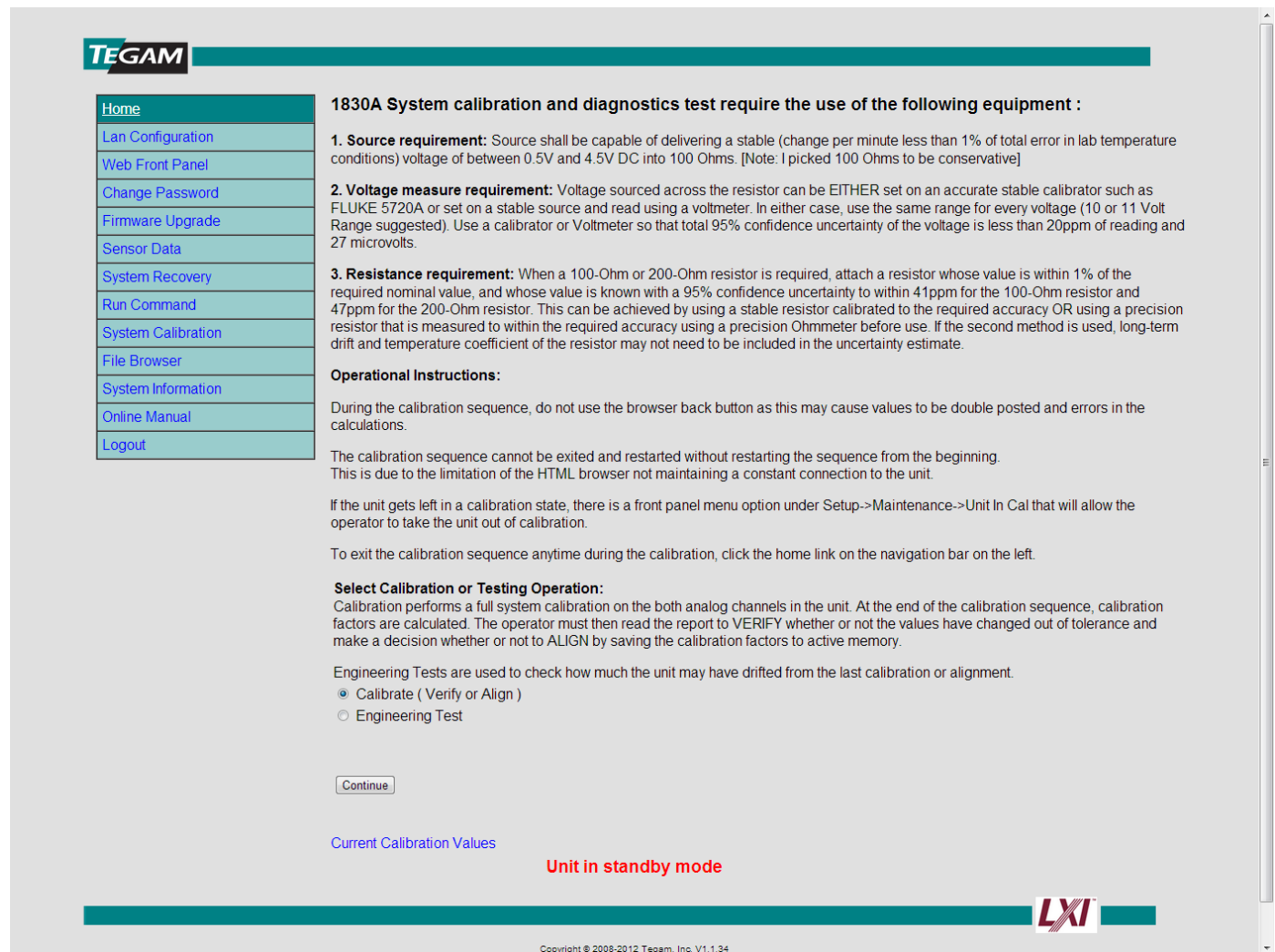
Figure 5.6 - System Calibration Web Page

1830A Calibration Procedure

Once a calibration is started it must be completed. The automated process will step the user though an entire calibration of both channels. Unlike Diagnostics the user will not be able to select specific procedures. The entire process takes less than an hour. Refer to Figure 5.7 for the first step in the calibration. Detailed procedures and diagrams will be provided for each step of the calibration (Refer to Figures 5.4 & 5.5).

Step 1 - Zero the Servo Loop :

Testing analog channel 1

Purpose :
This operation is done to eliminate any difference between the voltages across the bolometer and reference resistor when the loop is balanced.

Wiring setup:
Do not connect the Force + or Force - wires to anything.
Connect the Sense + and Sense - wires across the 200 Ohm resistor.
Connect the shield wire from the Sense pair to the Sense + terminal of the resistor.

Do not connect the wires to the calibrator (or DMM or voltage source).
View connection diagram here

Instructions :
Click 'Start' to start the test.
This test can take approximately 10 minutes or more to run.

Start

Unit in standby mode

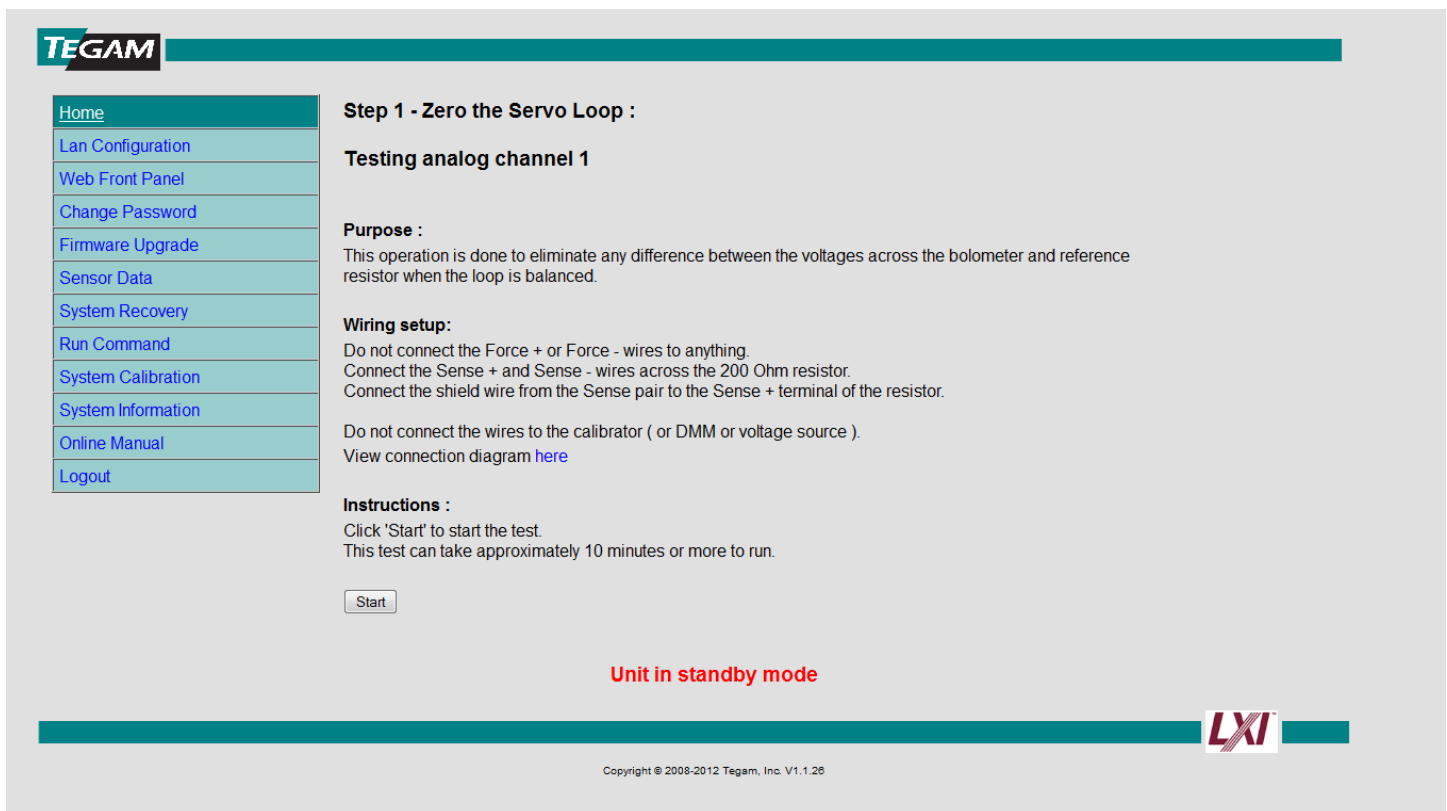Copyright © 2008-2012 Tegam, Inc. V1.1.26

Figure 5.7 First Step in Calibration Example

WARNING Once calibration is complete the user will be asked to save data. If the user chooses to save the new data, all previous calibration data will be lost.

WARNING Once calibration is complete the user will be asked to save data. If the user chooses not to save the new data, all new calibration data will be lost.

Troubleshooting

The 1830A is designed to be calibrated and verified without removing the cover or any other disassembly. However there may a time when the 1830A is not operate correctly or within specifications.

Check the Basics

Before calling TEGAM or returning the power meter for service, please make the following checks. If the meter is still not responding correctly refer to the return policy and documentation in Section 1 of this manual.

- Check that the line socket has power.
- Check that the power meter is plugged into the proper ac power source.
- Check that the power meter is switched on.
- Check that the line fuse is in working condition.
- Check that the other equipment, cables, and connectors are connected properly and operating correctly.
- Check the equipment settings in the procedure that was being used when the problem occurred.
- Check that the test being performed and the expected results are within the specifications and capabilities of the power meter.
- Check the power meter display for error messages.
- Check with a different power sensor.

Replacing the Power Line Fuse

1. Slide the fuse holder assembly from the rear panel.
2. Install the correct fuse or fuses. (250 V, 1.5 Amp Slow Blow Fuse)
3. Replace the fuse holder assembly in the rear panel.

Check the Specifics

Once the basics have been checked a few more specific issues can be addressed without removing the cover. Here are some common issues and suggested trouble shooting techniques.

Problem:
I am unable to view LXI webpage interface.

Solution:
- Verify 1830A is connected to network or designated computer.
- Verify Network Link Activity as explained in Section IV.
- Verify LAN Configuration as explained in Section IV.
- Ping the 1830A from the control computer.

Problem:
I am unable to exit Standby.

Solution:
- Verify 1830A is connected to sensor.
- Verify sensor cable is fully connected to the 1830A and the sensor.
- Verify correct compensation mode is selected.

Problem:
I am getting a voltage error on channel 2 causing the 1830A to enter Standby mode.

Solution:
- Verify 1830A is connected to a sensor.
- Verify sensor cable is fully connected to the 1830A and the sensor.
- Verify correct compensation mode is selected. This is probably the issue. If you try to use a TEGAM thermistor such as a M1130A in 423 Compatible Mode it will cause the 1830A to error this way.

These are a few of the most common faults that occur with the 1830A. Please contact TEGAM if any other issues should arise.

Reprogramming the 1830A

NOTE: Refer to Section IV to establish a connection via the LXI interface.

1. Establish TCP/IP connect with 1830A (You will need LXI interface).
2. Download the 1830A_v1.1.18a.bin and 1830A_WebFix.bin files to a folder on your computer.
3. Place the Unit in Standby Mode
4. Open a web browser, and go to the units home page by going to http://{unit IP address}.
5. Click 'Login' on the left navigation pane.
6. Enter 'admin' as the login password. This is the default password when the unit ships. It may be changed for installations.
7. Click 'Firmware Upgrade' on the left navigation pane.
8. Using the web interface, upload the `1830A_WebFix.bin' file. This file fixes an issue with the web interface where files greater than 2Meg in size cannot be uploaded. The upgrade stops the 1830A webserver for a few seconds, so give the upgrade a little time to happen. Please note the web browser may show a time out or connection error. This is normal as the unit needs to restart its internal web server to apply the fixes.
9. Navigate back to the unit's home page by going to http://{unit IP address}. The unit will show the web interface once the web server has restarted. You can tell if the upgrade was applied successfully by the Copyright notice at the bottom of the page, it should show 'V1.1.18' if the fix was installed properly.
10. Access the 'Firmware Upgrade' interface again, upload the `1830A_v1.1.18a.bin' file. This file will take a little time to upload, please don't double click on upload button to make it go faster. The 1830A Application will shut down, and status information will be displayed on the LCD screen. Allow the update to proceed, the unit will reboot when it is finished. Once the unit has rebooted, it is ready for use.

Memory Sanitization Procedure

There are two methods to sanitize the memory of the 1830A. These methods are based on an SD card being present in the 1830A or not. Both Methods will cause errors in the 1830A and it will have to be sent to TEGAM to restore 1830A to a usable condition.

Method 1 - If the firmware version is v1.1.50a or higher there is not an SD card in your 1830A and you would follow the following steps.

- Open the LXI webpage with a web browser.
- Login to the LXI webpage. (Password is admin)
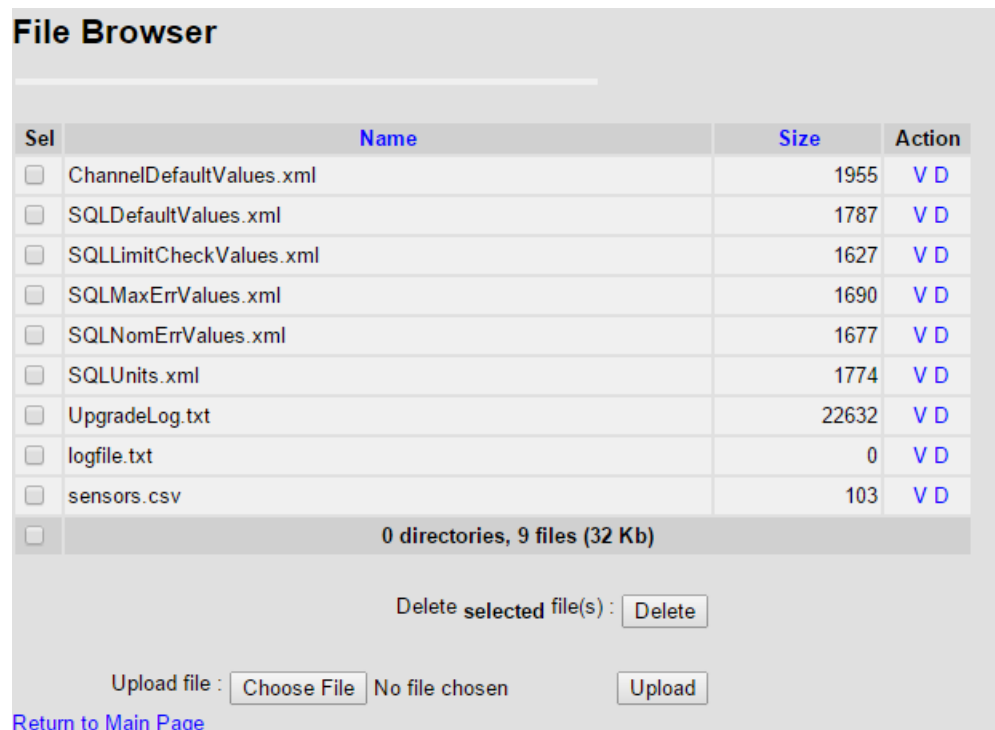- Navigate to File Browser Page

File Browser

Sel	Name	Size	Action
☐	ChannelDefaultValues.xml	1955	V D
☐	SQLDefaultValues.xml	1787	V D
☐	SQLLimitCheckValues.xml	1627	V D
☐	SQLMaxErrValues.xml	1690	V D
☐	SQLNomErrValues.xml	1677	V D
☐	SQLUnits.xml	1774	V D
☐	UpgradeLog.txt	22632	V D
☐	logfile.txt	0	V D
☐	sensors.csv	103	V D
☐	**0 directories, 9 files (32 Kb)**		

Delete **selected** file(s) : [Delete]

Upload file : [Choose File] No file chosen [Upload]

Return to Main Page

Figure 6.1 File Browser

- Select All Files
- Delete all files on file browser page

Method 2 - If the firmware is prior to 1.1.50a there is an SD card present and the procedure is to remove the SD RAM and destroy it.

Returning Power Meter for Service
Use the information in this section if you need to return your power meter to TEGAM.

Package Power Meter for Shipment
Use the following steps to package the power meter for shipment to TEGAM for service:

1. Fill the EXPEDITE REPAIR & CALIBRATION FORM (found in Section I) and attach it to the power meter. Please be as specific as possible about the nature of the problem. Send a copy of any or all of the following information:
   o Any error messages that appeared on the power meter display.
   o Any information on the performance of the power meter.

2. Use the original packaging materials or a strong shipping container. The carton must be both large enough and strong enough to accommodate the power meter and allow at least three to four inches on all sides of the power meter for packing material.

3. Surround the power meter with at least three to four inches of packing material or enough to prevent the power meter from moving in the carton.

4. Seal the shipping container securely with strong nylon adhesive tape.

5. Mark the shipping container "FRAGILE, HANDLE WITH CARE" to ensure careful handling.

Caution: Power meter damage can result from using packaging materials other than those specified.

6. Retain copies of all shipping papers.

Storage Requirements

When the Model 1830A is to be stored for extended periods, pack the instrument into a container. Place container in a clean, dry, temperature-controlled location. If instrument is to be stored in excess of 90 days, place desiccant with items before sealing container.